FIRST® LEGO® League Challenge SUBMERGED℠ Building Instructions

Build 13: Research Vessel

This build is 216 pieces, and 96 building steps.

Welcome to text-based instructions from Bricks for the Blind. Before you start building, here are some terms we'll be using:
- In Front of/Front: towards you.
- Behind/Back: away from you.
- Up: towards the ceiling.
- Down: towards the floor.
- Stud: the bump on a LEGO brick. Example: A 2x1 brick has two studs on it.
- Vertically: going from front to behind.
- Horizontally: going from left to right.
- Upright: pointing up towards the ceiling.
- That one/ppp: previously placed piece.
- Plate: piece with studs.
- Tile: smooth piece without studs (unless otherwise specified)
- Symmetrically: a mirror image. Example: If you place a 2x1 brick with technic connector on the front wall at the right, connector to the front, and then place another such piece symmetrically on the back wall, at the right, the technic connector of the second piece should point to the back, since it will be placed symmetrically.
- Centered-vertically: even amount of space in front of and behind the piece
- Centered-horizontally: even amount of space left and right of the piece.
- Row: studs lined up horizontally (left to right/side to side).
- Column: studs lined up upright or vertically (top to bottom/back to front).
- Standing upright: the piece is perpendicular to the ground, like a wall.
- Lying flat: the piece is parallel to the ground, like a piece of toast which fell off the table.
- Anti-stud: the portion of a piece which accepts studs, like the bottom of a plate.
- Jumper plate: a 1x2 plate with a single stud on top, or a 1x3 plate with only two studs on top.

A note on LEGO Technic™ part names. These parts are somewhat different from regular LEGO bricks. Here are some definitions in case the builder or helper is not familiar with LEGO Technic™.

Axles - An axle is a connector which has an X shaped cross-section. Because their cross section is not round, anything connected to an axle using an axle-hole will rotate with that axle. Axles are longer than they are wide, and the length of an axle corresponds with how many bricks long it is. Aka a 3L axle is three bricks long. Axles come in a variety of lengths, with a 2L axle being the shortest available. They may be combined with pins, or have circular stops on them. A stop prevents the axle from sliding through an axle-hole at a specific point on the axle.

Pins - A pin is a connector which has a circular cross section and a flanged notch out of one or both ends. This flanged notch allows them to click into bricks with a pin-hole. Pins come with and without friction ridges, which are small bumps on the pin which prevent them from rotating freely. For standard pins, black is a high friction pin, and gray is a low friction pin. A standard length pin is two brick lengths long, with a stop in the middle. This prevents a brick from being pushed from one side of the pin to the other. A 1L pin is one brick long and still retains the stop, however it also includes a hollow stud at the other end. A 3L pin is three bricks long, and only contains a stop at one side, allowing two bricks to be pushed onto the other side of the pin. Pins may also have one side which is an axle.

Lift-arms - A lift-arm is a basic structural element, similar to a brick or a plate, but usually without any studs. It is a beam with rounded ends and with holes in it, with the same spacing as the studs on a LEGO brick. lift-arms come in a variety of lengths, including a 1x1 lift-arm which looks like a cylinder. Thick lift-arms are as wide as a LEGO brick, and thin lift-arms are half as wide as a LEGO brick, but not the same thickness as a LEGO plate! The holes in a lift-arm arm may accept axles or pins. They also come in a variety of shapes, including tees, ells and triangles.

Gears - A gear is a functional element. They are typically discs with teeth on the outside, there are also worm gears which look like a spiraling cylinder! Gears connected by axles transmit or even transform rotational motion!

Axle and Pin Connectors - These elements are typically smaller than lift-arms and are used to connect some combination of pins or axles. They might have pins or axles, as well as axle or pin-holes. They have a lot of different angle combinations! The simplest just connects two axles or pins together in a straight line.

Bushes/Bushings - LEGO Technic™ uses bushes largely as spacers, but they also can reduce friction between rotating parts, or can form useful elements such as handles. Bushes are typically light gray, generally cylindrical, and have an axle-hole running through the middle. They have a flange at the front and back to make them easier to pull on and off.

Technic™ Bricks and Plates – There are also regular bricks and plates that are adapted for use with Technic™ elements. Technic™ bricks have holes for either pins or axles on the sides and are only one brick wide. One of the most common of these is a 1x2 brick with a single pin hole. Most often, these bricks have pin holes, not axle holes. Technic™ plates have holes on the flat surface between the studs and are a minimum of two bricks wide. The holes in these plates can accept pins, or can allow an axle to pass through and still spin.

For builders with low vision, or a sighted building partner who may want to follow along with the printed visual instructions that come with each set. As low vision users may benefit from viewing the instructions on a personal device where they can zoom in on content and use assistive technologies to enhance the visuals.

Sorting the pieces:

This LEGO set comes in the bags labeled 26-29. Additional pieces are in the unlabeled bag. Sort the pieces into groups as described below. Note that where there are multiple colors of the same brick in a step, the colors will be split across two groups to make telling the difference easier for the builder! LEGO includes a few spare parts in case you lose something. Set these into their own group away from the rest, in case you need them later.

Build 13 (17 groups of bricks)
Group A contains all of the black 2L pins from this bag. These pins have friction ridges.
Group B contains all of the blue 3L pins from this bag. These pins have friction ridges.
Group C contains all of the blue 2L axle/pin combos from this bag. These pins have friction ridges.

Group 1 contains the pieces for steps 1-5.
Group 2 contains the pieces for steps 6-12.
Group 3 contains the pieces for steps 13-18. This includes a black 13L liftarm from the unlabeled bag.
Group 4 contains the pieces for steps 19-25.
Group 5 contains the pieces for steps 26-34. This includes a black 13L liftarm from the unlabeled bag.
Group 6 contains the pieces for steps 35-43. This includes a black 13L liftarm from the unlabeled bag.
Group 7 contains the pieces for steps 44-51.
Group 8 contains the pieces for steps 52-61.
Group 9 contains the pieces for steps 62-68.

Group 10 contains the pieces for steps 69-75. This includes two white 15L liftarms, two blue 13L liftarms, and two white 3x13 curved panels from the unlabeled bag.
Group 11 contains the pieces for steps 76-80.
Group 12 contains the pieces for steps 81-88.
Group 13 contains the pieces for steps 89-91. Include the small black panel fairing #22 from step 92.
Group 14 contains the pieces for steps 92-96.

Building Instructions:

Main build.

Open groups A, B, C and 1. You will use the pins from groups A, B and C throughout the build.

1.1. We'll start by building a rectangular frame. This might be a drydock that you can put the research vessel in. Place a light gray 11L liftarm in front of you, vertically with the holes facing left and right.

1.2. Push two black 2L pins from group A, from the right into the second holes from the front and back on the right side of the previous piece.

2. Find a black 5x11 panel. This piece has five pin holes on each short end, seven pin holes on each long side, and four pin holes on the top and bottom. One side is flat, and one side has a gap between the two long rows of pin holes. Orient this piece so the sides with five holes are standing upright at the front and back, the sides with seven holes are vertically on the top and bottom, and the indented side is at the left. Push the bottom two holes on the left side of this piece, from the right onto the pins from the previous step. The sides should be even with the sides of the 11L liftarm.

3. Push two black 2L pins from group A, from the front into the bottom and third from the bottom holes on the front side of the previous piece. Repeat this symmetrically on the back side.

4. Find a black 3x11 panel. This looks like the 5x11 panel, but with only three holes on the short side. Rotate it so the sides with three holes are upright at the left and right, the sides with seven holes are horizontal on the top and bottom, and the indented side is at the front. Push the left two front facing holes on this piece onto the front two pins from the previous step. The left side of this piece should be even with the left side of the 11L liftarm. Repeat this symmetrically on the back side.

5.1. Place a black 3x3 T-shaped liftarm in front of you, standing upright with the flat part on the bottom and the holes facing forward.

5.2. Push two black 2L pins from group A, from the back into the middle hole on the bottom row and the top hole of the previous piece.

5.3. Push these two pins, from the front into the right two front facing holes on the front 3x11 panel.

5.4. Repeat steps 5.1-5.3 symmetrically on the back side. This completes the first half of the drydock.

Open group 2.

6.1. Now we'll build the other half, set the first half aside. Place a light gray 11L liftarm in front of you, vertically with the holes facing left and right.

6.2. Push two black 2L pins from group A, from the left into the second holes from the front and back on the left side of the previous piece.

7. Orient a black 5x11 panel so the sides with five holes are standing upright at the front and back, the sides with seven holes are vertically on the top and bottom, and the indented side is at the right. Push the bottom two holes on the right side of this piece, from the left onto the pins from the previous step. The sides should be even with the sides of the 11L liftarm.

8. Push two black 2L pins from group A, from the front into the bottom and third from the bottom holes on the front side of the previous piece. Repeat this symmetrically on the back side.

9. Orient a black 3x11 panel so the sides with three holes are upright at the left and right, the sides with seven holes are horizontal on the top and bottom, and the indented side is at the front. Push the right two front facing holes on this piece onto the front two pins from the previous step. The right side of this piece should be even with the right side of the 11L liftarm. Repeat this symmetrically on the back side.

10.1. Place a black 3x3 T-shaped liftarm in front of you, standing upright with the flat part on the bottom and the holes facing forward.

10.2. Push two black 2L pins from group A, from the back into the middle hole on the bottom row and the top hole of the previous piece.

10.3. Push these two pins, from the front into the left two front facing holes on the front 3x11 panel.

10.4. Repeat steps 10.1-10.3 symmetrically on the back side.

11. Find a light gray 3x3 perpendicular pin connector. This looks like two 3L liftarms which form a 90-degree angle. There are two pins each on the outer sides of the liftarms. Push this piece, with one pair of pins pointing left and one pointing down, from the top into the leftmost and third from the left holes on top of the front 3x11 panel. Repeat this on the back side.

12.1. Push two black 9L liftarms, upright with the holes facing left and right, from the left onto the left pins of each of the pieces from the previous step. These liftarms should extend six holes above the previous piece.

12.2. Push a black 2L pin from group A, from the left, into the top pin holes of each of the pieces from the previous step.

Open group 3.

13.1. Now we'll make a little panel to push. Set the second half of the drydock aside for now. Place a yellow 3L liftarm in front of you, horizontally with the holes facing forward.

13.2. Push two blue 3L pins from group B, with the stop rings at the front, from the front into the left two holes of the previous piece. Push them all the way to the back so they extend 1L to the front and back.

14. Push the middle two holes of a yellow 2x4 L-shaped liftarm, with the short leg upright on the left and the long leg at the bottom pointing horizontally to the right, from the back onto the back of the two pins from the previous step. The right side of this piece should be even with the right side of the 3L liftarm in front of it.

15.1. Find a black 3L liftarm with perpendicular axle connector. This piece looks like a 3L liftarm with an axle hole on one side. The axle hole is parallel to the long axis of the liftarm. It looks like a liftarm with a bushing on one side. Place this piece in front of you, vertically with the pin holes facing up and the axle hole on the right facing forward.

15.2. Push two black 2L pins from group A, from the top into the front and back holes on the top of the previous piece.

15.3. Push a light gray 3L axle, from the front into the axle hole of the 3L liftarm with perpendicular axle connector. Push it in until it extends evenly to the front and back. Its front and back sides should be even with the front and back of the triple pin and perpendicular axle connector.

15.4. Slide the back side of the axle, from the front into the leftmost hole on the L-shaped liftarm. There should now be one axle and two pins on the front of the assembly.

16. Push the left three holes of a yellow 2x4 L-shaped liftarm, with the short leg upright on the left and the long leg at the bottom pointing horizontally to the right, from the front onto the pins and axle on the front of the assembly. Its right side should be even with the liftarms behind it.

17. Push a black 13L liftarm, vertically with the holes facing up and centered vertically, from the top on to the left two pins on top of the push panel assembly.

18.1. Place the second half of the drydock in front of you, with the 5x11 panel vertically at the right and the two 3x11 panels at the front and back pointing to the left. The flat parts of the two T-shaped liftarms on the 3x11 panels should be touching the table. Find the pins on the two upright 9L liftarms on the left side of the drydock.

18.2. Rotate the 13L liftarm with the push panel so the holes on the liftarm face left and right, the 3L liftarm is on the right, and the push panel hangs down. Push the front and back holes on the 13L liftarm, from the left, onto the two pins on the upright part of the drydock. This completes the drydock. Note that the two halves of the drydock do not connect to each other.

Open group 4.

19.1. Now we'll start building the research vessel. Set the drydock halves aside for now. Place a black 5x11 panel in front of you, so the sides with seven holes are horizontally at the front and the indented side is at the bottom.

19.2. Push a black 2L pin from group A, from the front into the leftmost hole on the front of the previous piece. Repeat this symmetrically on the back side.

20.1. Push two blue 3L pins from group B, with the stop rings at the bottom, from the top into the right two top facing holes on the 5x11 panel. This should extend 2L above the panel.

20.2. Push a blue 3L pin from group B, with the stop ring at the back, from the front into the rightmost hole on the front side of the 5x11 panel. This should extend 2L in front of the panel. Repeat this symmetrically on the back side.

20.3. Push two blue 3L pins from group B, with the stop rings at the right, from the left into the front and back holes on the left side of the 5x11 panel. These should extend 2L to the left of the panel.

21. Push a black 5L liftarm, vertically with the holes facing left and right, from the left onto the two pins from the previous step. Push this all the way to the right so the pins extend 1L to the left. Repeat this with a second black 5L liftarm, so the pins are completely covered.

22. Push a black 9L liftarm, vertically and centered vertically with the holes facing up, from the top onto the two 3L pins which point up on the 5x11 panel. This liftarm should overhang two holes to the front and back. Push this all the way down so the pins extend 1L above it. Repeat this with another black 9L liftarm, so the pins are completely covered.

23.1. Push two blue 3L pins from group B, with the stop rings at the bottom, from the top into the second and fourth holes from the front on the previous piece. These should extend 2L above the previous piece and there should be one hole between them. Repeat these symmetrically on the back side.

23.2. Push two black 2L pins from group A, from the top into the front and back holes on the top 9L liftarm. They should be next to 3L pins.

24. Push the front two holes of a white 3L liftarm, vertically with the holes facing up, from the top onto the front two pins on the 9L liftarm. The front of this piece should be even with the front of the 9L liftarm and its back hole should be free. Repeat this symmetrically on the back side.

25.1. Find a dark gray 2x3 U-shaped liftarm. This looks like two parallel 2L liftarms connected by a 1L liftarm whose pin hole is perpendicular to the holes on the 2L liftarms. Push the corner holes of this piece, with the U opening to the right and the holes facing up, on the pins between the pieces from the previous step. Push the U-shaped liftarm all the way down so the 3L pins extend 1L above it.

25.2. Push two black 2L pins from group A, from the top into the rightmost two holes on top of the previous piece. There should be one column of four pins, and one column of two pins pointing up on the right side of the research vessel.

Open group 5.

26. Push a white 9L liftarm, vertically with the holes facing up, down on top of the left column of four pins. Its sides should be even with the liftarms below it. There should now be a vertical wall on the right side of the build.

27.1. Keeping the base flat on the table, rotate the research vessel 180 degrees so the wall is now on the left. Find the two pins facing forward on the bottom of the build. Push a black 13L liftarm, horizontally with the holes facing forward, from the front onto these pins. The second hole from the left on the liftarm should go on the left pin. Push it all the way back so the leftmost pin extends 1L in front of it.

27.2. Push a black 2L pin from group A, from the front into the fourth hole from the right on the previous piece.

28.1. Now we'll build one side panel of the vessel's hull. Set the rest aside for now. Find a black 11x3 curved panel. This piece looks similar to a 3x11 panel, except that it is curved. It has one smooth, curved side and one hollow side. It has one long side with five holes, two short sides with two holes each, and two perpendicular holes going through the panel on the side opposite the five-holes. Place this piece in front of you, so the side with five holes is at the front, and the smooth, curved side is at the bottom.

28.2. Push two black 2L pins from group A, from the front into the rightmost and second from the left holes on the front side of the previous piece.

29. Push two black 2L pins from group A, from the right into the holes on the right side of the curved panel.

30. Find a black 5x3x2 left corner quarter ellipse. This piece looks like a quarter of an elongated curved dome. It has one smooth, curved side and one hollow side. One side has an L-shaped pattern of four holes, and one long side has a row of three holes perpendicular to the L-shaped pattern. Rotate this piece so the L-shaped holes are at the left and the row of three holes is at the top facing forward. The smooth, curved side should be at the back. Push this, from the right onto the two pins from the previous step. The curve on the back of this piece should match the curve of the curved panel.

31.1. Push two blue 3L pins from group B, with the stop rings at the back, from the front into the rightmost two holes on the previous piece. Push them all the way in so they extend 2L to the front.

31.2. Push a light gray 1L pin with a hollow stud, with the hollow stud at the front, into the hole to the left of the pieces from the previous step.

32. Push a light gray 2L liftarm, horizontally with the holes facing forward, from the front onto the two 3L pins. Push it all the way back so the pins extend 1L past it to the front.

33. Find a light gray 3L axle and pin connector with two perpendicular pin holes. This looks like a 3L liftarm, except that the hole on one end is an axle hole that is perpendicular to the two pin holes. Push this, horizontally with the axle hole facing up on the right and the pin holes facing forward, from the front onto the two pins extending from the previous piece.

34. Set the rest of the research vessel in front of you, with the wall vertically on the left. Find the two pins on the front of this assembly. Rotate the side assembly 90 degrees away from you, so the side of the curved panel with five holes is on top. The corner quarter ellipse should be at the right. There should be two holes on the backside at the bottom. Push these two holes onto the two pins on the front of the research vessel.

Open group 6.

35.1. Now we'll build the back of the ship. Set the rest of the research vessel aside for now. Place a light gray 9L axle horizontally in front of you. This is the longer of the two axles in this group.

35.2. Push a light gray thin bushing, from the right onto the previous piece. Push it so there is 2L of axle exposed to the right of it.

35.3. Push a light gray thick bushing, from the right onto the axle. Push it up against the previous piece so the axle extends 1L past it to the right.

36. Find a black 3x5x3 curved panel. This panel looks kind of like a chair and it only has two holes, one at each end. It has one long side and one short side which meet to form a corner. Rotate this piece so the holes face left and right, the short side is at the back, and the corner points down. Slide the back hole, from the left onto the axle hole. Slide it all the way to the right until it touches the thin bushing.

37.1. Place a yellow 7L axle horizontally in front of you.

37.2. Push a light gray thin bushing, from the right onto the previous piece. Push it so there is 1L of axle exposed to the right of it.

37.3. Slide this assembly, from the right through the front hole of the curved panel. Slide it all the way to the left until the thin bushing touches the curved panel.

38. Push two light gray thick bushings, from the left onto the back axle. Push them all the way to the right until they touch the curved panel. Repeat this for the front axle.

39. Slide another black 3x5x3 curved panel, in the same orientation as the first, from the left onto the two axles.

40. Push a light gray thin bushing, from the left onto the back axle. Push it all the way to the right until it touches the curved panel. Repeat this for the front axle.

41. Push a light gray thick bushing, from the left onto the back axle. Push it all the way to the right until it touches the back previous piece.

42. Set the rest of the ship in front of you, with the vertical wall at the right. The side panel of the ship we made should be at the back. Find the leftmost axle hole of the 3L axle and pin connector with two perpendicular pin holes at the top left of the side panel we made. In front of the side panel, at the bottom, there is a liftarm with one front-facing hole extending to the left of the bottom of the ship. Rotate the back of the ship 90 degrees counterclockwise, so the longer axle is at the left. Align the longer axle with the axle hole we found, and the shorter axle with the hole at the bottom. Push the back assembly all the way back.

43.1. Find the two pins and one axle facing forward on the bottom of the build. Push the leftmost hole of a black 13L liftarm, horizontally with the holes facing forward, from the front onto the axle, so the rest of the liftarm connects to the pins. The second hole from the right on the liftarm should go on the rightmost pin. Push it all the way back so the rightmost pin extends 1L in front of it.

43.2. Push a black 2L pin from group A, from the front into the fourth hole from the left on the previous piece.

Open group 7.

44.1. Now we'll build the other side panel of the ship. Set the rest of the build aside for now. Place a black 11x3 curved panel in front of you, so the side with five holes is at the front, and the smooth, curved side is at the bottom.

44.2. Push two black 2L pins from group A, from the front into the leftmost and second from the right holes on the front side of the previous piece.

45. Push two black 2L pins from group A, from the left into the holes on the left side of the curved panel.

46. Find a black 5x3x2 right corner quarter ellipse. This is the mirror to the one we used in step 30. Rotate this piece so the L-shaped holes are at the right and the row of three holes is at the top facing forward. The smooth, curved side should be at the back. Push this, from the left onto the two pins from the previous step. The curve on the back of this piece should match the curve of the curved panel.

47.1. Push two blue 3L pins from group B, with the stop rings at the back, from the front into the leftmost two holes on the previous piece. Push them all the way in so they extend 2L to the front.

47.2. Push a light gray 1L pin with a hollow stud, with the hollow stud at the front, into the hole to the right of the pieces from the previous step.

48. Push a light gray 2L liftarm, horizontally with the holes facing forward, from the front onto the two 3L pins. Push it all the way back so the pins extend 1L past it to the front.

49. Push a light gray 3L axle and pin connector with two perpendicular pin holes, horizontally with the axle hole facing up on the left and the pin holes facing forward, from the front onto the two pins extending from the previous piece.

50. Set the rest of the research vessel in front of you, with the wall vertically on the right. Find the two pins on the front of this assembly. Rotate the side assembly 90 degrees away from you, so the side of the curved panel with five holes is on top. The corner quarter ellipse should be at the left. There should be two holes on the backside at the bottom. Push these two holes onto the two pins on the front of the research vessel.

51.1. Now we'll make the sides of the ship taller. Place a white 3x11 panel in front of you so the sides with three holes are upright at the left and right, the sides with seven holes are horizontal, and the indented side is at the front.

51.2. Push a blue 2L axle/pin combo from group C, with the axle side at the left, from the left into the middle hole on the left side of the previous piece.

51.3. Find a light gray panel fairing #8, very small, smooth, short, side B. This piece has one smooth, curved side and one hollow side. It has two axle holes in a T-shaped pattern. If you stand it up on the axle hole that is the stem of the T, with the smooth, curved side at the back, the left side of the fairing should be pointed and the right side should be straight. Keeping the piece in this orientation, push the top axle hole, from the left onto the previous piece. The bottom of this piece should be even with the bottom of the 3x11 panel.

51.4. Locate the two top-facing pins on the rear wall of the research vessel. Push the left and right holes on the bottom side of the 3x11 panel, from the top onto these pins.

Open group 8.

52.1. Now we'll repeat the same thing symmetrically on the front wall of the ship. Place a white 3x11 panel in front of you so the sides with three holes are upright at the left and right, the sides with seven holes are horizontal, and the indented side is at the back.

52.2. Push a blue 2L axle/pin combo from group C, with the axle side at the left, from the left into the middle hole on the left side of the previous piece.

52.3. Find a light gray panel fairing #7, very small, smooth, short, side A. This is the mirrored version of the piece from the previous step. Rotate it so the axle hole that is the stem of the T is pointing down, with the smooth, curved side of the fairing at the front. Push the top axle hole, from the left onto the previous piece.

52.4. Locate the two top-facing pins on the front wall of the research vessel. Push the left and right holes on the bottom side of the 3x11 panel, from the top onto these pins.

53.1. Now we'll start building the bow of the ship. Set the rest of the vessel aside for now. Place a black 3L liftarm in front of you, vertically with the holes facing left and right.

53.2. Find a black 1L pin with a perpendicular pin hole on one side. This looks like a 1L pin which has a hollow cylinder on one side which is perpendicular to the pin. The hollow cylinder is a pin hole. Push the pin side of this piece, with the pin pointing left and the hole facing up, from the right into the middle hole of the previous piece.

54. Push two black 2L pins from group A, from the left into the front and back holes of the 3L liftarm.

55. Find a black 3x3x1 square liftarm. This piece is shaped like a square with five holes forming a cross on the flat sides. Two sides are rounded, and the other two sides have two holes each. Push this piece, lying flat with the rounded sides on the front and back, from the left onto the two pins from the previous step.

56.1. Push two black 2L pins from group A, from the left into the two holes on the left side of the previous piece.

56.2. Find the six holes on top of the assembly. Four form a row across the middle of the assembly, with two on either side of the row at the front and back. Push three black 2L pins from group A, from the top into the leftmost, rightmost, and second from the right holes in the middle row of holes. There should be one open hole between the left two pins.

57. Find a red 7L liftarm with perpendicular holes. This looks like a normal 7L liftarm, except that every hole is perpendicular to its neighbors. Push this piece, horizontally with the smooth sides at the front and back, from the top onto the pins from the previous step. Push the pins into the left three holes of this piece so it overhangs by two holes to the right.

58. Push two blue 3L pins from group B, with the stop rings at the front, from the front into the right two holes on the front of the previous piece. There should be one free hole on the front of this piece to the left of these pins. Push them all the way in so they extend 1L to the front and back.

59. Push a black 5L liftarm, horizontally with the holes facing forward, from the back onto the back side of the pins from the previous step. Push the leftmost and third from the left holes of the liftarm onto the pins so it extends one hole to the right past the 7L liftarm with perpendicular holes.

60.1. Now we'll make the very tip of the ship. Set the rest of the bow aside for now. Find a black double pin and perpendicular axle connector. This piece looks like a 2L liftarm with an axle hole on one side. The axle hole is parallel to the long axis of the liftarm. It looks like a liftarm with a bushing on one side. Place this in front of you, with the 2L liftarm vertical at the bottom, and the axle hole facing forward.

60.2. Push two black 2L pins from group A, from the right into the two pin holes on the right side of the previous piece.

61. Find a black 5x3x2 right corner quarter ellipse. Rotate this piece so the L-shaped holes are at the left and the row of three holes is at the top facing up. The smooth, curved side should be at the back. Push the bottom hole in the long leg of the L-shaped hole pattern, from the right onto the back pin from the previous step.

Open group 9.

62. Now we'll make the pointy part of the bow. Find a black 5x3x2 left corner quarter ellipse. Rotate this piece so the L-shaped holes are at the left and the row of three holes is at the top facing up. The smooth, curved side should be at the front. Push the bottom hole in the long leg of the L-shaped hole pattern, from the right onto the pin in front of the previous piece. It should be symmetrical to the previous piece.

63. Find the axle hole facing front and back which is to the left of the previous two pieces. Push a black 3L axle/pin combo which has a 2L axle and a 1L pin, with the pin side at the back, from the back into this hole. Push it all the way in so it extends 1L to the front and back.

64. Find the two axle holes which are at the corners of the L-shaped hole patterns on the two 5x3x2 corner quarter ellipses. These are right above the previous piece. Push two red 2L axles, from the left, into these holes.

65.1. Place a black 4L thin liftarm in front of you, lying down vertically with the holes facing left and right.

65.2. Push two blue 2L axle/pin combos from group C, with the pin side at the right, from the right into the front and back axle holes of the previous piece. Push them all the way in so they extend 0.5L to the left.

65.3. Push a black 4L thin liftarm, lying down vertically with the holes facing left and right, from the left onto the axle sides of the pieces from the previous step. Its left side should touch the first 4L thin liftarm.

65.4. Push the middle two holes of the two thin liftarms, from the left, onto the two axles on the left side of the pointy assembly so the pins on the thin liftarms connect to the two quarter ellipses.

66. Place the rest of the bow in front of you, with the square liftarm at the bottom and the two pins in the square liftarm pointing left. There should be two other pins pointing forwards, and a 5L liftarm at the back which overhangs one hole to the right. Find the pin on the back side of the pointy part of the bow, which is below the two thin liftarms. Push this liftarm into the hole we identified.

67. There are now two pins and an axle on the front side of the bow assembly. Push a black 5L liftarm, horizontally with the holes facing forward, from the front onto these.

68. Now place the rest of the research vessel in front of you, with the open side up, and the straight walls at the front, right, and back side. The front left and back sides of the research vessel should be curved at the bottom. Find the 5L liftarm on the bottom of the right side of the research vessel. Push the two holes on the left side of the bow into the second holes from the front and back of this liftarm.

Open group 10.

69.1. Now we'll build the top of the bow. Set the rest of the research vessel aside for now. Place a blue 13L liftarm in front of you, horizontally with the holes facing up.

69.2. Push two blue 3L pins from group B, with the stop rings at the bottom, from the top into the leftmost and rightmost holes of the previous piece.

70. Now we'll make the walls curved! Find a white 3x13 curved panel. This is a flat piece, which has a pin hole at each end. Rotate this so it is horizontal with the concave side at the front. The holes should face up and down. Push the holes from the top onto the pins from the previous step. Push this piece all the way down so the pins extend 1L above it. The bottom side of this piece should be behind the liftarm.

71.1. Place a light gray 11L liftarm in front of you, vertically with the holes facing up.

71.2. Push two black 2L pins from group A, from the top into the front and back holes of the previous piece.

71.3. Push the second hole from the left of a white 15L liftarm, horizontally with the holes facing up, from the top onto the back pin from the previous step.

71.4. Push the leftmost and third from the right holes of the previous piece, from the top into the two 3L pins on the top of the blue 13L liftarm from step 69.1. The white 15L liftarm should overhang the blue one by two holes to the right.

72.1. Place a white 15L liftarm in front of you, vertically with the holes facing up.

72.2. Push a blue 3L pin from group B, with the stop ring at the bottom, from the top into the back hole of the previous piece.

72.3. Push a white 1L liftarm, from the top onto the previous piece. Push it all the way down so the blue 3L pin extends 1L above it.

72.4. Push the pin of this liftarm, from the bottom into the rightmost hole of the 15L liftarm from step 71.4.

73.1. Place a white 3x13 curved panel in front of you, vertically with the concave side at the left. The holes should face up and down.

73.2. Push two blue 3L pins from group B, with the stop rings at the top, from the top into the holes of the previous piece.

73.3. Push these pins into the vertical 15L liftarm on the bow wall assembly so that the front pin goes into the front hole. The bottom side of this piece should be to the right of the liftarm.

74.1. There are now three legs of this assembly, two 15L sides with curved panels, and an 11L liftarm. We're going to make these into a triangle. We're going to do this by rotating the two vertical sides. Move the gray 11L liftarm so that the black pin pointing up at the front lines up with the two blue pins pointing up from the front 13L white liftarm and the 15L side clockwise until the front pin of the 11L liftarm is behind the front pin of the vertical 15L side. The three pins on top of this 15L and 11L liftarm should all be in line.

74.2. Push a blue 13L liftarm, diagonally in line with the front 15L side and with the holes on top, from the top onto these three pins. The pins should go into the leftmost, rightmost, and second from the left holes on the 13L liftarm. The bow wall assembly should now be a triangle. Rotate it so the light gray 11L liftarm is vertical and the point of the triangle is at the right.

75. Place the rest of the research vessel in front of you, with the bow at the right. Find the two pins sticking up from where the bow attaches to the rest of the ship. Push the 11L liftarm, centered vertically. down onto these pins.

Open group 11.

76.1. Find a black 7x3 curved panel. This piece looks like a shorter version of the 11x3 curved panel. Place this piece in front of you, so the side with five holes is at the front, and the smooth, curved side is at the bottom.

76.2. Push two black 2L pins from group A, from the front into the left and right holes on the front side of the previous piece.

76.3. Push a blue 2L axle/pin combo from group C, with the pin side at the right, from the left into the back hole on the left side of the 7x3 curved panel.

76.4. Find a black 2x1x1 curved panel. This piece has a hollow cylinder which has an axle hole, and a curved side that sticks out of this. If you view it from one side, it looks like a comma. Rotate this piece so the tail of the comma points down at the back and the axle hole faces left and right. Push this from the left onto the previous piece. Then, rotate the tail of the comma towards you so that it is in line with the bottom of the 7x3 curved panel.

76.5. Now we'll attach this to the bottom of the ship. Keeping the bow at the right, flip the ship upside down. Find the front diagonal liftarm which is part of the triangle of liftarms on the bow. You should be able to feel 9 holes on the top of this liftarm. Rotate the 7x3 curved panel so the side with five holes is at the bottom, the 2x1x1 curved panel is at the top right, and the smooth, curved side is at the front. Push the pins on the bottom, from the top into the third free holes from the left and right sides of the diagonal liftarm.

77.1. Now we'll repeat this symmetrically on the back side. Place a black 7x3 curved panel in front of you, so the side with five holes is at the front, and the smooth, curved side is at the bottom.

77.2. Push two black 2L pins from group A, from the front into the left and right holes on the front side of the previous piece.

77.3. Push a blue 2L axle/pin combo from group C, with the pin side at the left, from the right into the back hole on the right side of the 7x3 curved panel.

77.4. Find a black 2x1x1 curved panel and rotate it so the tail of the comma points down at the back and the axle hole faces left and right. Push this from the right onto the previous piece. Then, rotate the tail of the comma towards you so that it is in line with the bottom of the 7x3 curved panel.

77.5. Now we'll attach this on the back side. Find the back diagonal liftarm which is part of the triangle of liftarms on the bow. Rotate the 7x3 curved panel so the side with five holes is at the bottom, the 2x1x1 curved panel is at the top right, and the smooth, curved side is at the back. Push the pins on the bottom, from the top into the third free holes from the left and right sides of the diagonal liftarm.

78.1. Place a white 9L liftarm in front of you, vertically with the holes facing left and right.

78.2. Push a black 2L pin from group A, from the left into the middle hole of the previous piece.

78.3. Push two black 2L pins from group A, from the right into the second holes from the front and back on the 9L liftarm.

78.4. Keeping the bow at the right, flip the ship over so it is right side up. Find the two liftarms which run vertically across the ship at the left side of the triangle. Keeping it vertical, rotate the 9L liftarm counterclockwise so the middle pin points down. Push this pin through the middle hole of the left liftarm we just identified.

79.1 Place a white 2x4 L-shaped liftarm in front of you, with the short leg vertically on the right and the long leg at the back pointing horizontally to the left.

79.2. Push a blue 2L axle/pin combo from group C, with the pin side at the top, from the top into the leftmost axle hole of the previous piece.

79.3. Push a blue 3L pin from group B, with the stop ring at the bottom, from the top into the front right hole of the L-shaped liftarm. Push it all the way down so it extends 2L above the liftarm. This should be on the front hole of the short leg of the L-shaped liftarm.

79.4. Rotate the L-shaped liftarm 180 degrees away from you so both pins point down, the short leg is vertically on the right and the long leg is at the front pointing horizontally to the left.

79.5. Find the 9L liftarm that runs vertically across the ship that we placed in step 78.4. It has two pins pointing up on it. Push the back right pin on the L-shaped liftarm into the hole in front of the front pin on the 9L liftarm. Push this assembly all the way down.

79.6. Now we'll repeat this symmetrically on the back side. Place a white 2x4 L-shaped liftarm in front of you, with the short leg vertically on the right and the long leg at the front pointing horizontally to the left.

79.7. Push a blue 2L axle/pin combo from group C, with the pin side at the top, from the top into the leftmost axle hole of the previous piece.

79.8. Push a blue 3L pin from group B, with the stop ring at the bottom, from the top into the back right hole of the L-shaped liftarm. Push it all the way down so it extends 2L above the liftarm. This should be on the back hole of the short leg of the L-shaped liftarm.

79.9. Rotate the L-shaped liftarm 180 degrees away from you so both pins point down, the short leg is vertically on the right and the long leg is at the back pointing horizontally to the left.

79.10. Place this symmetrically to the first L-shaped assembly on the back side of the ship.

80. Find a white 5x7 hollow frame. This looks like two 7L liftarms connected by two 5L liftarms, forming an open rectangle. Rotate this frame so the 7L liftarm sides are on the left and right and the 5L liftarms are at the front and back. Push the two left corner holes, from the top, onto the two pins between the two L-shaped liftarms from step 79. The hollow frame should extend to the right.

Open group 12.

81.1. Now we'll make the deck over the bow. Set the rest of the ship aside for now. Find a blue 3x9 L-shaped quarter ellipse. This looks like a 3x9 L-shaped liftarm, where the space between the legs is filled in with a curve. Place this piece in front of you, with the short leg vertically on the left and the long leg at the front pointing horizontally to the right. The curved section should be at the back.

81.2. Push a blue 2L axle/pin combo from group C, with the pin side at the top, from the top into the front left corner axle hole of the previous piece.

82. Push two black 2L pins from group A, from the top into the two holes behind the previous piece. Push another from the top into the rightmost pin on the 3x9 quarter ellipse.

83.1. Push the right hole of a blue 2L liftarm, horizontally with the holes facing up, from the top onto the back pin of the 3x9 quarter ellipse. It should overhang one hole to the left.

83.2. Push a black 2L pin from group A, from the bottom into the left hole of the previous piece.

84.1. Push the back two holes of a blue 5L liftarm, vertically with the holes facing up, from the top onto the two pins in front of the 2L liftarm. It should overhang three holes in front of the 3x9 quarter ellipse.

84.2. Push the back hole of a blue 3L liftarm, vertically with the holes facing up, from the top onto the rightmost pin on the 3x9 quarter ellipse.

85.1. Place a blue 9L liftarm in front of you, horizontally with the holes facing up.

85.2. Push two blue 3L pins from group B, with the stop rings at the bottom, from the top into the leftmost and rightmost holes on the previous piece.

85.3. Push the two pins on this piece, from the bottom, into the middle holes of the vertical 5L and 3L liftarms that are on top of the 3x9 quarter ellipse. The left and right sides of the 9L liftarm should be even with the sides of the 3x9 quarter ellipse.

86.1. Place a blue 3x9 L-shaped quarter ellipse in front of you, with the short leg vertically on the left and the long leg at the back pointing horizontally to the right. The curved section should be at the front.

86.2. Push a blue 2L axle/pin combo from group C, with the pin side at the top, from the top into the back left corner axle hole of the previous piece.

86.3. Push a black 2L pin from group A, from the top into the hole in front of the previous piece. Push another from the top into the rightmost pin on the 3x9 quarter ellipse.

86.4. Push the pins on this piece, from the bottom, into the remaining holes on the 5L and 3L liftarms that are on top of the first 3x9 quarter ellipse. The left and right sides of this piece should be even with the pieces behind it. It should mirror the first 3x9 quarter ellipse.

87.1. Push a black 2L pin from group A, from the top into the front left hole of the front 3x9 quarter ellipse.

87.2. Push the right hole of a blue 2L liftarm, horizontally with the holes facing up, from the top onto the previous piece. It should overhang one hole to the left.

87.2. Push a black 2L pin from group A, from the bottom into the left hole of the previous piece.

88. Place the rest of the ship in front of you, with the bow at the right. Find the 5x7 hollow frame on top of the ship, then find the two corner holes on top of the right side of it. Push the two pins on the two 2L liftarms on the deck, from the top into these holes.

Open group 13.

89.1. Find a black 2x5 L-shaped quarter ellipse. This looks like a smaller version of the 3x9 L-shaped quarter ellipse. Place this piece in front of you, with the short leg upright on the right and the long leg at the top pointing horizontally to the left. The curved section should be at the bottom and the holes should face front and back.

89.2. Push a black 3L axle/pin combo which has a 2L axle and a 1L pin, with the pin side at the front, from the front into the top right corner hole of the previous piece. Push it all the way in so it extends 1L in front of and behind the quarter ellipse.

89.3. Push a black 2L pin from group A, from the back into the hole to the left of the previous piece.

89.4. Push a blue 3L pin from group B, with the stop ring at the front, from the front into the leftmost hole on the 2x5 quarter ellipse. Push it all the way in so it extends 1L in front of and behind the quarter ellipse. There should be two holes between this piece and the previous piece.

89.5. Rotate the entire assembly so the short leg of the quarter ellipse is vertically on the right and the long leg is at the front pointing horizontally to the left. The curved section should be at the back. Find the column of holes between the two 2L liftarms on the front and back sides of the deck. There should only be two holes in this column. Push the right pin from the assembly we just made from the top into the rear of these two pins. The left pin should attach to the left column of the 5x7 hollow frame.

90.1. Place a black 2x5 L-shaped quarter ellipse in front of you, with the short leg upright on the left and the long leg at the top pointing horizontally to the right. The curved section should be at the bottom and the holes should face front and back.

90.2. Push a black 3L axle/pin combo which has a 2L axle and a 1L pin, with the pin side at the front, from the front into the top left corner hole of the previous piece. Push it all the way in so it extends 1L in front of and behind the quarter ellipse.

90.3. Push a black 2L pin from group A, from the back into the hole to the right of the previous piece.

90.4. Push a blue 3L pin from group B, with the stop ring at the front, from the front into the rightmost hole on the 2x5 quarter ellipse. Push it all the way in so it extends 1L in front of and behind the quarter ellipse. There should be two holes between this piece and the previous piece.

90.5. Place this assembly symmetrically to the first one.

91. Push a black 3L liftarm, vertically with the holes facing up, from the top on the leftmost pins of the two previous assemblies. You should have one piece leftover when you are done with this group.

Open group 14.

92.1. Take the black panel fairing #22, very small, smooth, short, side B you had leftover from the last group. This piece has one smooth, curved side and one hollow side. It has one axle hole on the short flat side, and two pin holes on the long flat side. If you stand it up on the axle hole with the smooth, curved side at the back, the two pin holes should face left. Rotate this piece so the pin holes are on the bottom and the axle hole is at the left. The smooth side should be at the front. Push the two pin holes, from the top, onto the two pins on the front 2x5 quarter ellipse.

92.2. Find a black panel fairing #21, very small, smooth, short, side A. This is the mirror of the previous piece. Rotate this piece so the pin holes are on the bottom and the axle hole is at the left. The smooth side should be at the back. Push the two pin holes, from the top, onto the two pins on the back 2x5 quarter ellipse. It should be symmetrical to the fairing #22 from the previous step.

93.1. Find a black 7x7 ring with two 1L axle connectors. This piece is a large ring which has two axle connectors opposite each other. Place this piece in front of you, so that it is flat like a basketball hoop, with the axle connectors on the left and right.

93.2. Find a blue axle and pin connector with one axle. This piece looks like a 1L axle connected to a cylinder with a pin hole in the middle of it. Push this piece, with the axle at the left and the pin hole facing up, from the right into the right axle connector of the previous piece. Repeat this symmetrically on the left side of the ring.

93. Find the pin facing up all the way at the right side of the ship, and the other facing up between the right sides of the two small fairings from step 92. Push the two axle and pin connectors on the ring, from the top onto these pins.

94.1. Now we'll make the ship's mast. Place a white 1x1 round plate with a hollow stud in front of you.

94.2. Place a white sphere on the previous piece.

94.3. Push a black 8L bar with a pin on one side and a stop ring on the other, with the pin at the bottom, from the bottom into the hollow anti-stud of the 1x1 round plate.

95.1. The mast has multiple radar dishes. We'll build three identical ones. Set the mast aside for now. Place three white 1x1 round plates with hollow studs in front of you.

95.2. Find a white 2x2 inverted dish. This looks like a shallow bowl or a plate with a single stud on top and a single anti-stud on the bottom. Place this piece, with the stud facing up, on one of the previous pieces. Repeat this for the other two.

95.3. Find a white 1L bar with a clip on one side. With the clip at the bottom, push this piece from the bottom into the hollow anti-stud of one of the 1x1 round plates. Repeat this for the other two.

95.4. Hold the mast upright, with the sphere on the top. Push the clip of one radar dish on just below the sphere. Rotate this dish so it points away from you. Place another dish below the first, pointing to the right. Place the last dish below the second, pointing towards you.

96. Set the ship in front of you, with the bow at the right. Find the vertical 3L liftarm to the left of the two small fairings on top of the ship. Push the pin on the bottom of the mast, from the top through the middle hole of this piece.

Congratulations! Now this build is complete!

Thank you so much for building this set!

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