10363 Leonardo da Vinci's Flying Machine
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Explore the evolution of aeronautical innovation or gift a history-lover with the LEGO® Icons Leonardo da Vinci's Flying Machine (10363) home and office desk decor building set for adults. Craft a detailed model of da Vinci's visionary ornithopter featuring an open airframe with flappable textile-covered wings driven by a visible interplay of string, hinges and pulleys. This captivating centerpiece includes a display stand with an attachable Leonardo da Vinci minifigure holding a quill and sketch.

Da Vinci ornithopter building set for adults – Immerse yourself in the history of aeronautical innovation with the Lego Icons Leonardo da Vinci's Flying Machine building project for adults.

What's in the box – Everything you need to craft a detailed Lego interpretation of da Vinci's visionary ornithopter, plus a display stand and a Leonardo da Vinci minifigure holding a quill and sketch.

Trigger-activated wings – Recreate Leonardo da Vinci's flying machine with its flappable textile wings and tail driven by an intricate, visible mechanism of string, hinges and pulleys.

Home and office desk decor – Add a striking centerpiece to the home or office with this detailed display model depicting Leonardo da Vinci's Flying Machine.

A Lego gift for history-lovers – Celebrate a birthday or special occasion with this gift for history-lovers and fans of aviation and historic innovation.

Dimensions – The model flying machine in this 493-piece building set measures over 25 centimeters (10 inches) high, 29 centimeters (11.5 inches) long and 35 centimeters (13.5 inches) wide.

The front of the box shows the finished flying machine, which is built in shades of brown and tan to mimic the appearance of wood. The machine is angled so it is flying away from the viewer which, thanks to the angled black display stand, means we can clearly see the top of the machine. The flying machine has a triangular body, thick at the front and narrow at the rear, with broad wings on either side and a fanned tail made from fabric elements stretched over hidden elements. Special string elements connect the wings and tail to a system of pulleys and hinges that hint at the model's functionality. To the side of the flying machine stands a minifigure of its designer, the famous polymath Leonardo da Vinci. He has long white hair and a flowing white beard which tumbles down the front of his dark blue robes. In his right hand he holds a tile printed with a blueprint for the flying machine, and his left hand is a quill.

A panel on top of the box shows the minifigure in more detail, revealing that da Vinci's brow is furrowed in concentration. A side view of the flying machine shows more of the structure beneath the wings, which is formed of brown curved bar elements. The fuselage is open and boxy.

On the back of the box we are treated to a view of the model from the front. There is a spot on the display stand to place the da Vinci minifigure and a printed tile on the base that reads 'Leonardo da Vinci's Flying Machine'. An inset panel shows a wireframe diagram which proclaims the finished model to be 35 centimeters (13.5 inches) wide and 25 centimeters (10 inches) tall. Below the other images, a series of three panels show that the position of the tail can be set by pulling an unobtrusive trigger, while the wings can be flapped by pressing on paddles on either side of the fuselage. A final panel shows the model on display in a modern home, which also serves to show that the model can be set on the stand either horizontally or vertically as the builder prefers.

The set includes 493 pieces divided between 4 bags and placed over the course of 167 steps. The set is aimed at builders ages 18 and up.

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: with the longest side going from front to back
- Horizontally: with the longest side going from left to right.
- Upright: pointing up towards the ceiling.
- 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.
- That one/ppp: previously placed piece.
- Plate: piece with studs.
- Tile: smooth piece without studs (unless otherwise specified)
- A jumper plate is a 1x2 plate with a single stud on top, or a 1x3 plate with only two studs on top.
- “Anti-stud” is a term for the portion of a LEGO piece which accepts studs, like the bottom of a plate or brick.
- 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 piece
- Centered-horizontally: even amount of space left and right of 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).

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, PDF versions are always online at [https://www.lego.com/en-us/service/building-instructions/10363]: 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.

To begin a successful build, it helps to sort the pieces into groups, bags or small containers. Have a sighted friend or family member do this in advance following the instructions below. You will see that the pieces should be sorted into groups according to the building steps in the set. Doing this in advance makes locating the pieces easier. See below on how to sort the pieces to correspond to the steps in this set. Number the containers using letters A-Z, numbers or meaningful names. The parts will be collected into a small number of steps in the instructions. Example: Steps 1-3 means collect all the parts used in steps 1, 2 and 3, and put them in one container.

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.

Technic brick - a brick which contains one or more holes which accept Technic pins.

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 flanges at the front and back to make it easier to pull them on and off.

Bag 1 (5 groups of bricks) – display stand
Group 1 – steps 1-9
Group 2 – steps 10-13
Group 3 – steps 14-23
Group 4 – steps 24-31
Group 5 – steps 32-40

Bag 2 (5 groups of bricks) – flying machine
Group 1 – steps 41-50. Please connect the brown 1x2 plates together to distinguish them from the tan 1x2 plates – avoid stacking them directly on top of each other, as it makes the pieces difficult to separate.
Group 2 – steps 51-58
Group 3 – steps 59-64
Group 4 – steps 65-69
Group 5 – steps 70-76. Again, connect the tan 1x2 plates to distinguish them from the brown 1x2 plates.

Bag 3 (6 groups of bricks) – flying machine
Group 1 – steps 77-79
Group 2 – steps 80-87
Group 3 – steps 88-92
Group 4 – steps 93-96
Group 5 – steps 97-112
Group 6 – steps 113-124

Bag 4 (5 groups of bricks) – flying machine and da Vinci minifigure
Group 1 – steps 125-132
Group 2 – steps 133-142
Group 3 – steps 143-153
Group 4 – steps 154-166 – includes fabric elements from separate envelope
Group 5 – step 167 (Leonardo da Vinci minifigure)

The print instructions are provided in a single booklet. The cover of the booklet shows a partial view of the underside of the flying machine, prominently showing the fabric wings and tail, strings, pulleys and links which form the mechanism.

The print instructions begin with a two-page spread introducing the source material and its author, Leonardo da Vinci. The test is presented in black boxes against a collage of da Vinci's sketches and handwritten notes. The first page introduces the man himself: "Artist, artisan, aviation architect: Leonardo da Vinci (1452-1519) is the undisputed master of Renaissance innovation. Adored by his contemporaries for his visionary talent, boundless curiosity and flamboyant character, da Vinci is still rightfully celebrated for his creative ingenuity. He devoted his life to exploring and pushing boundaries

in art, human and animal anatomy, physics and engineering, with unrivalled passion, determination and craftsmanship. Painted masterpieces like the Mona Lisa and The Last Supper originally catapulted him to worldwide fame, but his lifelong fascination with human flight invokes equal awe."

The next page shows a picture of the flying machine from above and the following quote from da Vinci, oriented sideways: "The noblest pleasure is the joy of understanding."

Turning over, the following page features the following text: "Imitating the flight of birds: Although, reportedly, Leonardo da Vinci's aeronautical inventions never came to life during his time, his ideas, designs and studies proved valuable inspiration for the first working aircraft centuries later. The ornithopter is one of his most famous works, but they all rest on the same idea of a single person piloting a mechanical machine with wings. Using their own body strength, the pilot would pull and push on cranks and strings that would make the wings flap up and down."

Below the text is another quote from da Vinci: "Simplicity is the ultimate sophistication."

The last page before the instructions begin features a note from the designers: "From the Lego design team: "This was where our concepting started – to make a machine with moveable parts that are all linked together and activated when pulling on strings or, in this case, one single string. It's a seemingly simple model, yet a great Lego engineering challenge. The model is designed to look as if it was made from wood, linen and rope. It has a brick-built skeleton for the tail and wings, and textile wings with a printed pattern. Incorporating the textile string as the main part of the wing-flapping mechanism was a great challenge! The mechanical parts of the model are left exposed to celebrate the functional parts and Leonardo's vision and to let our own interpretation of the original design take flight." – Antica Bracanov, Lego Senior Designer"

Retrieve the first bag of pieces, which contains the parts to build the display stand. Open the first group of pieces.

1. Find a black 2x12 plate and a black 1x2 Technic brick with axle hole. Position the 2x12 plate horizontally, then place the brick vertically on the rightmost column.

2. Get two more black 1x2 Technic bricks with axle holes and orient them vertically. Place them on the two columns to the left of the previous brick.

3. Collect a black 2x2 plate, a black 2x4 bottom hinge plate with pin hole at one end, and a black 2x5 bracket. Start by orienting the bottom hinge plate horizontally with the pin hole to the left, then place it on the left four columns of the assembly. Put the 2x2 plate to the right of the hinge plate. Finally, orient the bracket horizontally with the upper studs to the right and connect it to the right of the 2x2 plate so the right two columns of the piece sit on top of the Technic bricks placed previously.

4. Locate a black 1x2 plate and a red 4L axle. Place the plate vertically on the rightmost column of the assembly. Next, orient the axle horizontally and insert it into the axle hole at the model's right end. Push it in as far as it will go – a 1L segment of the axle will protrude to the right.

5. Take a black 1x2 Technic brick with axle hole and a black 2x6 curved slope. Place the brick vertically to the left of the bracket's step, five columns in from the right end of the build. Orient the slope horizontally with the studs to the right and place it to the left of the brick.

6. Bring two black 1x6 tiles and place them horizontally on the front and back rows so their right ends align with the right end of the assembly. There should be one free column of studs to their left.

7. Gather the following pieces, with which we will create a part: two black 1x3x2 arches, a black 2x2 brick, a black 1x2 Technic brick with axle hole, and two black modified 1x2 plates with pin hole on the bottom. Assemble the part as follows:
7.1. Orient an arch piece horizontally with the overhang to the right, then take the 2x2 brick and place its front right stud on the left stud of the arch.
7.2. Hold the second arch horizontally overhanging to the right and connect it behind the first so its left stud sits under the back right stud of the 2x2 brick.
7.3. Put the 1x2 brick vertically under the left column of the 2x2 brick.

7.4. Orient the modified 1x2 plates horizontally with the pin holes to the left. Connect them under the front and back rows of the part.
7.5. Add the part under the display stand's left end so their left ends align.

8. Find a black 1x2 plate and two black 1x2 inverted curved slopes. Orient an inverted slope horizontally with the lower stud to the right, then hold the 1x2 plate vertically and connect its back stud to the right stud of the slope. Take the second slope and orient it in the same way as the previous slope, then connect its right stud under the front of the 1x2 plate. Add the part under the right end of the larger assembly so their right ends align.

9. The last pieces of the group are a blue 1L axle with pin and a black 3L pin with bush stop. Hold the 3L pin horizontally with the bush stop to the left, then insert the axle end of the 1L axle with pin into the bush stop. Orient the part vertically with the bush stop toward the rear and insert it into the top pin hole at the left end of the assembly from the rear.

10. Retrieve the second group of parts. Collect the following, with which we will construct a part: a black 1x1 Technic brick with pin hole, a black 1x2 Technic brick with axle hole, a black 1x2x1 2/3 brick with 2x2 side studs, a black 1x1 plate, a black 1x2 plate, and a blue 1L axle with pin. Create the part by following the procedure below:
10.1. Orient the 1x2 brick horizontally, then hold the 1L axle with pin vertically with the axle in front. Insert the axle into the axle hole from the rear.
10.2. Add the 1x2 plate horizontally on top of the brick.
10.3. Take the 1x2x2/3 brick with 2x2 side studs and put it horizontally on top of the plate with the side studs facing forward. Then put the 1x1 plate on the right stud.
10.4. Hold the 1x1 Technic brick with the pin hole facing front and back and apply it to the 1x1 plate.
10.5. To add the completed part to the assembly, we must first carefully align the pins and pin holes. Locate the front pin at the top of the left end of the main assembly and align it with the pin hole at the top of the part, then align the pin at the bottom rear of the part with the pin hole at the bottom of the main assembly. Press the parts together to unify them.

11. Now we will create a second part which is the mirror image of the first, and which will be connected to the rear of the main assembly. To begin, gather the following: a black 1x1 Technic brick with pin hole, a black 1x2 Technic brick with axle hole, a black 1x2x1 2/3 brick with 2x2 side studs, a black 1x1 plate, a black 1x2 plate, and a blue 1L axle with pin. Then complete the steps below:
11.1. Orient the 1x2 brick horizontally, then hold the 1L axle with pin vertically with the axle in front. Insert the axle into the axle hole from the rear.
11.2. Add the 1x2 plate horizontally on top of the brick.
11.3. Take the 1x2x2/3 brick with 2x2 side studs and put it horizontally on top of the plate with the side studs facing forward. Then put the 1x1 plate on the left stud.
11.4. Hold the 1x1 Technic brick with the pin hole facing front and back and apply it to the 1x1 plate.
11.5. Turn the part around so the side studs face away and the pin protrudes in front. Just as with the previous part, carefully align the top pin hole with the rear pin at the top of the main assembly and the pin of the part with the rear pin hole at the bottom of the display stand. Press them together when the pins and holes are aligned.

The print instructions include the following fact about da Vinci and his work: "One of da Vinci's machines, known as 'Il Grande Nibbio', was inspired by and named after a bird from the Accipitridae family: the kite."

Rotate the assembly so the left edges of the parts connected to the left end of the display stand sit flat against your building surface. The studs of the 1x1 Technic bricks should now face left, and the central section of the stand should now rise up from the ground at a subtle angle.

12. We need to build up the base to make the stand more stable. To do so, start by getting a black 2x4 brick and two black 1x4 arches. Hold the 2x4 brick horizontally, then connect an arch horizontally under the back row of the brick before placing the second in front of the first. Reorient the part on its side with the studs of the brick facing left. Connect the studs of the part to the anti-studs at the left end of the display stand base.

13. The remaining pieces of the group should be a black 1x12 brick, a black 1x12 plate, and four black 1x2 tiles. Construct a part: orient the plate horizontally and stack the brick on top. Put a tile horizontally at the left end of the part, then place another to the right. Add the remaining tiles symmetrically at the right end of the brick. There should be four free studs between the tiled sections. Orient the part vertically on its side with the studs facing left and center it on the left end of the base.

Set aside the assembly while we create a part over the next several steps.

14. Open the third group of pieces and obtain a black 2x2 brick and a black 2x2 plate. Place the right column of the brick on top of the left column of the plate.

15. Get another black 2x2 plate and put its right column under the left column of the brick.

16. Find a black modified 2x2 plate with 1x2 horizontal side studs and orient it with the side studs facing back. Put it on top of the 2x2 brick.

17. Take a tan 1x2 plate and place it horizontally on the front row of the modified plate placed previously. Next, locate two black 1x2x1 2/3 bricks with 2x2 side studs. Orient one vertically with the side studs to the right and add it to the right column of the part, then add the second symmetrically to the left column.

18. Locate a black 2x2 brick and a black 2x2 plate. Connect the brick to the middle two columns of the part, then put the plate on top of the brick.

19. Collect two more black 1x2x1 2/3 bricks with 2x2 side studs and a black 2x2 plate. Orient a brick horizontally with the side studs facing right and put it on the right column of the part, then place the other symmetrically on the left column. Put the 2x2 plate on the middle 2x2 of studs.

20. Bring two black modified 2x2 plates with 1x2 horizontal side studs and another black 2x2 plate. Hold a modified plate with the side studs to the right and put it on the right two columns of the part, then put the second symmetrically to the left. Place the 2x2 plate on the middle 2x2 of studs, locking the modified plates in place.

21. Locate a black 2x4 tile – the tile is printed with white lettering which reads ‘Leonardo da Vinci’s Flying Machine’. Orient the tile horizontally with the text upright and connect it to the top of the part.

22. The part is complete and can be added to the model! Reorient the part so the tile on top faces left, then connect the base of the part to the left end of the base.

The print instructions include the following fact: “Da Vinci famously wrote in his notebooks in backwards handwriting. It could only be read correctly when reflected in a mirror.”

23. The final pieces in the third group are four black 1x2x1 2/3 bricks with 2x2 side studs. Orient them all horizontally with the side studs facing forward, then stack them in pairs to create two parts. Orient the first on its side with the top studs facing left and the side studs in front and connect it to the front right end of the display base. Add the other stack of bricks symmetrically at the rear right of the display base.

Again, set the main assembly aside while we work on constructing a part.

24. Retrieve the fourth group of pieces and take out a black 2x2 curved slope. Orient it with the narrow end to the right.

25. Collect a black 1x12 plate and a black 1x8 plate. Orient them horizontally, then place the right stud of the 1x12 plate under the rear of the left column of the slope. Connect the right stud of the 1x8 plate under the front of the slope’s left column.

26. Find a black 2x4 tile and two black 1x2 tiles. Hold the 2x4 tile horizontal and put it to the left of the curved slope, then add a 1x2 tile vertically to the left. Place the second 1x2 tile horizontally to the left of the first 1x2 tile on the back row of the part.

27. Locate a black 1x6 tile and a black 1x3 plate. Position the 1x6 tile horizontally to the left of the previously placed 1x2 tile on the back row of the part – the 1x6 tile will overhang to the left by two columns. Next, put the 1x3 plate horizontally under the tile's overhang. Only the left stud should be uncovered.

28. Obtain a black 1x3x2 inverted arch and a tan 1x1 round plate with hollow stud. Orient the inverted arch horizontally with the stud to the left and connect it to the two studs at the left end of the part's front row. Then, place the 1x1 round plate under the overhang of the inverted arch.

29. Get a black 2x2 curved slope and a tan 1x4 plate. Orient the curved slope with the narrow end to the left and connect its back right anti-stud to the stud at the left of the back row. Take the 1x4 plate and hold it horizontally, then put its left stud under the curved slope's front right.

30. Take a black 1x3x2 inverted arch and hold it horizontally with the stud to the right, then put it on the three exposed studs of the tan 1x4 plate placed previously.

31. The part is complete! Before we add the part to the display stand, first reorient it so the studs of the inverted arches face you and the sides of the inverted arches lie flat against the building surface. Connect the part to the side studs on the front of the display stand, allowing the inverted arches to sit on either side of the protrusion.

For the last time, put the display base to the side while we construct a part. The part is the mirror image of the last.

32. Retrieve the fifth and final group of parts and find a black 2x2 curved slope. Hold it with the narrow end to the left.

33. Find a black 1x12 plate and a black 1x8 plate. Orient them horizontally, then place the left stud of the 1x12 plate under the rear of the right column of the slope. Connect the left stud of the 1x8 plate under the front of the slope's right column.

34. Collect a black 2x4 tile and two black 1x2 tiles. Hold the 2x4 tile horizontal and put it to the right of the curved slope, then add a 1x2 tile vertically to the right. Place the second 1x2 tile horizontally to the right of the first 1x2 tile on the back row of the part.

35. Locate a black 1x6 tile and a black 1x3 plate. Position the 1x6 tile horizontally to the right of the 1x2 tile on the back row of the part. The 1x6 tile will overhang to the right by two columns. Next, put the 1x3 plate horizontally under the tile's overhang. Only the right stud should be uncovered.

36. Get a black 1x3x2 inverted arch and a tan 1x1 round plate with hollow stud. Orient the inverted arch horizontally with the stud to the right and connect it to the two studs at the right end of the part's front row. Then, place the 1x1 round plate under the arch's overhang.

37. Bring a black 2x2 curved slope and a tan 1x4 plate. Orient the curved slope with the narrow end to the right and connect its rear left anti-stud to the right rear stud. Take the 1x4 plate and hold it horizontally, then put its right stud under the curved slope's front left.

38. Take a black 1x3x2 inverted arch and hold it horizontally with the stud to the left, then put it on the three exposed studs of the tan 1x4 plate placed previously.

39. The part is complete. Reorient it on its side with the anti-studs facing you and the sides of the inverted arches flat against the building surface, then apply it to the side studs at the rear of the display base. The inverted arches should flank the block protruding to the rear.

40. The final pieces of the first bag are eight black 1x1 plates and two black 1x4 double-curved slopes. Use them to make two of the following part:
40.1. Take two 1x1 plates and stack them.
40.2. Orient a curved slope horizontally, then connect its right end to the top of the stack of plates.
40.3. Stack two more 1x1 plates then put them under the slope's left end.

40.4. To place the first part, first orient it horizontally on its side with the anti-studs in the rear, then connect the legs of the part onto the studs of the inverted arches on the front of the display base. Add the second part symmetrically to the rear of the display base.

The print instructions include the following fun fact: “Leonardo da Vinci is known to have produced more than 35000 words and 500 sketches on flight and flying machines!”

You have completed the display stand and, with it, the first bag of the set! The stand is a sleek black construction with only two visible studs, which function as a place to put the da Vinci minifigure. Put the stand to the side while we construct the star of the set: the flying machine itself!

41. Open the second bag and collect the first group of parts. Retrieve a brown 4x6 plate and a tan 1x2 inverted bracket with 1x2 horizontal side studs. Place the 4x6 plate horizontally in front of you, then orient the inverted bracket vertically with the side studs to the left and put it on the rear two studs of the left column.

42. Get another tan 1x2 inverted bracket with 1x2 horizontal side studs and a dark brown 1x4 tile. Orient the bracket vertically with the side studs to the left and place it in front of the previous bracket. Then, hold the tile vertically with the anti-studs facing right and apply it to the 1x4 of side studs formed by the two inverted brackets.

43. Locate two tan 1x2 plates and orient them vertically. Place the first vertically centered to the right of the brackets, then put the second to the right of the first.

44. Gather the following brackets: two dark tan 1x2 inverted brackets with 2x2 side studs, two medium nougat 1x1 inverted brackets with 1x2 vertical side studs, and two light grey 1x1 inverted brackets with single side stud. Take a 1x1 bracket with single side stud and orient it with the side stud in front, then place it in front of the left 1x2 plate placed previously. To the right, add a 1x2 bracket with 2x2 side studs with the side studs in front, then put a 1x1 bracket with 1x2 vertical side studs to the right of the 1x2 bracket, again with the side studs in front. Add the remaining parts symmetrically to the rear of the assembly.

45. Find another brown 4x6 plate and place its left column on the right column of the assembly.

46. Find two brown 1x2 plates – these parts should have been connected to distinguish them from the tan 1x2 plates. Orient them horizontally. Put one under the front studs of the second and third columns in from the left end of the plate placed in the previous step, then put the other symmetrically in the rear.

47. Obtain two brown 1x8 plates and orient them horizontally. Place the first to the right of the front 1x2 plate placed previously – the plate should protrude to the right of the 4x6 plate by five studs – then add the second symmetrically at the back.

48. Collect two tan 1x6 bricks, a tan 2x3 brick, and a tan 1x2 plate. Place the first 1x6 brick horizontally on the front row so its left stud sits on the leftmost column of the assembly. Put the 2x3 brick horizontally behind the previous part with its left column aligned with the left column of the 1x6 brick. Next, orient the 1x2 plate vertically and connect it three columns to the right of the 2x3 brick. Finally, add the remaining 1x6 brick on the back row with its left stud on the left column of the model.

49. Find a dark tan 2x2 slope brick, a tan 1x2 plate, and a dark brown 1x2 tile. Put the tan 1x2 plate vertically to the right of the other tan 1x2 plate placed in the previous step. Orient the slope brick with its studs to the left and place it three columns to the right of the 1x2 plate. Lastly, take the 1x2 tile and put it vertically on top of the studs of the slope brick.

50. The remaining pieces should be two brown 1x2 plates, two brown modified 1x2 plates with pin hole at one end, and two dark grey modified 1x2 plates with tow ball at one end. Begin by placing a 1x2 plate vertically centered on the leftmost column of the model. Next, orient a modified 1x2 plate with pin hole vertically with the pin hole in front and put it in front of the previous part – it will overhang in front of the model. Connect the second modified 1x2 plate with pin hole symmetrically at the rear of the column. Now orient a modified 1x2 plate with tow ball vertically with the tow ball in front and place

it on the front two studs of the column to the right of the previous parts. The tow ball should overhang the front of the build. Place the second modified 1x2 plate with tow ball symmetrically behind the first. To finish, put the remaining 1x2 plate vertically centered on the column to the right of the tow ball plates.

51. Set the model aside for a few steps while we make a part. Open the second group of bricks and extract a light grey 9L axle and a tan 2L thin liftarm with axle holes. Orient the liftarm vertically with the axle holes facing left and right, then take the axle and insert it from the right into the rear axle hole. The liftarm needs to be placed 4 studs from the right end of the axle. There is a one-to-one scale diagram in the print instructions that shows exactly where to position the liftarm along the axle – if you have trouble with the instructions, ask a sighted helper to assist in aligning the parts. Alternatively, try the following: the group of parts contains two 1x4 Technic bricks, a 1L liftarm, and a second 2L thin liftarm with axle holes. The bricks and liftarm are one stud wide and have pin holes, and the thin liftarm is half a stud wide. Slide the parts with pin holes onto the axle from the left, then the thin liftarm. The parts just placed cover the three-and-a-half left studs of the axle. Shift the first thin liftarm along the axle to sit to the right of the other parts. The thin liftarm is now in the correct position! Remove the parts to the left of the right liftarm.

52. Take a red 2L axle and insert it into the front axle hole from the right. The axle should not protrude to the left of the liftarm.

53. Find a brown shock absorber element – this is a functional element which feels like a 6.5L liftarm with pin holes at each end with a spring between them. Pressing on the ends compresses the part. Releasing the pressure allows the spring to return the part to its initial length. Orient the shock absorber vertically with the pin holes facing left and right and the spring toward the front, then slip the rear pin hole onto the 2L axle from the right.

54. Locate a tan 1L liftarm and hold it with the pin hole facing left and right. Slide it onto the 9L axle from the right so it sits to the right of the 2L thin liftarm.

55. Get a tan 2L thin liftarm with axle holes and orient it vertically with the axle holes facing left and right. Insert the 9L axle into the rear axle hole from the left and slide the piece to the left so the front axle hole connects to the right end of the 2L axle.

56. Gather two light grey half-bushes and a red 4L axle. Orient the axle horizontally and slide a bush onto the axle from the left so it sits one stud in from the left end of the axle. To assist in placing the bush, note that there are two 1x4 Technic bricks left in the group which are one stud thick – slide one onto the left end of the axle so that the end of the axle aligns with the left side of the brick, then adjust the position of the bush as required. Alternatively, the print instructions include a one-to-one diagram showing how to position the bush on the axle, so a sighted helper may assist if preferred. Once aligned, take the part and insert the axle into the front pin hole of the shock absorber from the left, then slide the second half-bush onto the 4L axle from the right so it sandwiches the shock absorber between the bushes.

57. The final two pieces of the group are two tan 1x4 Technic bricks. Orient the subassembly so the shock absorber lies horizontally to the left and the 9L axle lies vertically. Then, hold a Technic brick horizontally and slide the middle pin hole onto the axle from the front until it meets the thin liftarm. Place the second brick symmetrically at the rear.

58. The part is now complete! Retrieve the main assembly and connect the part by attaching the Technic bricks to the front and back rows of the part so their right studs lie in front of and behind the vertical 1x2 tile on top of the slope brick in the middle right of the flying machine. The shock absorber should lie to the left of the Technic bricks but is loose and can be swung horizontally.

59. Collect the third group of pieces and find two black modified 1x2 plates with pin hole on top. Orient the pieces horizontally with the pin holes to the right, then slide them onto the front and rear of the 4L axle at the left end of the shock absorber. Hold them in place, then connect them to the right of the vertical pair of 1x2 plates with tow balls at the left end of the build. To do this, you will need to compress the shock absorber and press the parts into place in the same motion.

60. The tension in the spring is causing the fuselage of the flying machine to bow slightly – let's reinforce the fuselage to negate the effect. Locate two brown 1x4 plates and two brown 1x1 plates. Orient a 1x4 plate horizontally and place it to the right of the front modified 1x2 plate with pin hole on top. The plate spans two bricks, connecting them from the top as well as from underneath, thereby strengthening the connection greatly. Next, take a 1x1 plate and put it to the right of the 1x4 plate. Add the other parts symmetrically at the rear of the build.

61. Get two brown 2x3 plates and orient them horizontally. Place one on the front two rows of the left end of the assembly so their left edges align, then put the second behind the first.

62. Retrieve two black 2L pins, a dark brown 1x2 tile, and two dark brown 1x2 curved slopes. Hold a slope with the thin end in front and place it on the front two studs of the leftmost row of the model. Put the 1x2 tile vertically behind the slope, then place the remaining slope symmetrically behind the tile. Next, take a 2L pin and hold it horizontal. Navigate to the pin hole behind the slope previously placed, which sits under and behind the plate and faces left and right. Insert the pin into the pin hole from the left, then connect the second pin symmetrically at the front of the model.

63. Take two tan 1x2 plates and two dark brown 1x2 tiles and orient the parts horizontally. Navigate to the right end of the model, where horizontal 1x5 regions of studs protrude to the right of the body and have an empty space between them. Place a tile on the front row one stud in from the right, then add a plate to the left. Place the remaining parts symmetrically to the rear.

64. Gather four light grey 1x3 plates and two brown 1x1 plates. Use them to make two identical parts:
64.1. Take two 1x3 plates and stack them. Orient the part horizontally.
64.2. Put a 1x1 plate on the left stud of the part.
64.3. Repeat the above steps to obtain a second part. Then, place the first part so its middle and right studs sit on top of the front 1x2 plate placed in the previous step. Put the second part symmetrically at the rear.

65. Again, set the model to the side while we construct a part. Open the fourth group of pieces and collect a brown 1x4 plate and two black 1x1x2/3 modified half-round bricks with single side stud. Position the plate horizontally, then connect a modified brick under the left stud with its side stud facing front. Place the second modified brick symmetrically at the right end of the plate.

66. Find two medium nougat 1x1 inverted brackets with 1x2 vertical side studs. Hold one with its side studs facing left and connect it under the left modified brick placed in the previous step. Add the second symmetrically under the right modified brick.

67. Get two tan 1x2 brackets with 2x2 side studs and orient them with the side studs in the back. Put the first on the right two studs of the 1x4 plate, then add the second to the left.

68. Take a brown 1x4 plate and put it horizontally on top of the brackets placed in the previous step.

69. Gather two brown 1x2 plates, two brown 1x2 brackets with centered 1x2, and two tan 1x2 Technic bricks with two axle holes. Use them to make two of the following part:
69.1. Position a 1x2 plate horizontally and stack a Technic brick horizontally on top.
69.2. Hold a bracket with the studded section upright with the studs facing to the left, then connect it on top of the part.
69.3. Repeat the above steps to obtain two of the part. To attach the first part to the subassembly, orient it vertically on its side with the Technic brick to the rear with the pin holes facing left and right and the studs of the bracket in front and facing up. Connect the bottom anti-stud at the rear of the part to the front right single side stud of the subassembly. Attach the second part symmetrically to the left side stud of the subassembly. The tops of the parts should align with the front edge of the 1x4 plate placed previously.

70. Rotate the part so the 2x4 of side studs at the rear of the subassembly becomes right-facing. Open the fifth and final group of pieces and get a tan 1x4 plate and a dark brown 1x4 tile. Connect the plate across the bottom row of the 2x4 side studs, then put the tile above the plate.

71. Retrieve the main model and orient it horizontally with the pins at the left end. To attach the subassembly to the main model, go to the right end of the flying machine and place the part so the right column of the part sits on the right column of the main assembly. The left two columns of the part should connect to the right of the 1x1 plates placed in step 64, creating horizontal 1x4 regions of studs on the front and back rows.

72. Find four tan 1x2 brackets with 2x2 side studs. Orient two with their side studs in front. Put the first so its left stud sits in front of the vertical 1x2 tile to the right of the shock absorber, then place the second to the right of the first. The remaining two parts should be placed symmetrically in the rear.

73. Collect two medium nougat 1x1 inverted brackets with 1x2 vertical side studs, two brown 1x8 plates, and two brown 1x1 plates. Hold a 1x8 plate horizontal and put it so its right stud connects to the right stud of the front right bracket placed previously. To the left of the plate, place a bracket with the side studs facing forward, then put a 1x1 plate on the stud of the bracket. Add the remaining parts symmetrically in the rear.

74. Get two brown 2x3 tiles and two tan 1x2 plates. (The tan plates should be connected to distinguish them from the brown 1x2 plates in the group.) Take a 2x3 tile and hold it vertically upright with its anti-studs in the rear. Then, attach it to the side studs at the front left of the build so its bottom right corner coincides with the bottom right corner of the region of side studs. Next, take a 1x2 plate and put it on the side studs horizontally to the left of the bottom row of the 2x3 tile. Add the other tile and plate symmetrically at the back of the flying machine.

75. Gather four brown 1x1 quarter-round tiles, two brown 2x3 tiles, and two dark brown 1x4 tiles. Navigate to the horizontal 2x4 of side studs to the right of the protruding axle. Attach a 2x3 tile horizontally to the left three columns of side studs. Next, place a 1x1 quarter-round tile on the upper side stud to the right of the 2x3 tile with its curved edge in the upper right. Then take a 1x4 tile and place it horizontally under the quarter round tile – it should span a gap and connect to the lower of two side studs at the model's right end. Locate the side stud above the right end of the tile and add another quarter-round tile, this time with the curve in the upper left. Put the remaining parts symmetrically at the rear of the flying machine.

76. The final pieces in the group, and in the bag, are two brown 1x2 plates and two brown 1x4 double-curved slopes. Orient the pieces horizontally and make two parts by horizontally centering a double-curved slope on each plate. Put the first part at the right end of the front row of the model and the second on the right end of the back row.

You have reached the end of the second bag. The body of the flying machine is taking shape, with the shock absorber in the middle central to the set's functions. The third bag contains parts to build up the body, and at its end it will look significantly more like a flying machine!

77. Collect the first group of pieces from the third bag of the set. Gather the following: a black 2L axle, a dark brown 1x2 tile, a dark orange 2x2 plate, a brown 2x3 plate, a brown 2x3 brick, a brown modified 2x3 plate with hole, a brown 1x2 Technic brick with hole and dual liftarm extensions, and two brown 1x4 inverted curved slopes. Use them to construct a part:
77.1. Take a 1x4 inverted slope and hold it horizontally with the curve to the right. Then get the 2x2 plate and connect its front row to the left two studs of the slope.
77.2. Find the second 1x4 inverted slope and orient it horizontally with the curve to the right. Connect its left two studs under the back row of the 2x2 plate.
77.3. Locate a 2x3 plate and position it horizontally on the left side of the part so their left columns align. Put a dark brown 1x2 tile vertically on the subassembly's right column.
77.4. Retrieve a 2x3 brick and place it horizontally on top of the 2x3 plate.
77.5. Get a modified 2x3 plate with hole and orient it with the hole to the left. Connect its right two columns to the left two columns of the brick placed previously. Next, take the 1x2 Technic brick with dual liftarm extensions and orient it with the liftarms to the right. Put it to the right of the modified plate.
77.6. Finally, take the 2L axle and hold it vertically. Insert the rear of the axle into the front liftarm of the Technic brick but do not push it through.
77.7. Combine the subassembly with the main model by connecting the left end of the subassembly to the middle of the rightmost row of the model.

The print instructions contain the following fact about the flying machine: “Leonardo’s ornithopter, built for and test-piloted from a low altitude by a friend of the artist, wasn’t entirely successful. The machine crashed and da Vinci’s friend broke a leg.”

78. Find two dark orange 1x2 jumper plates, two brown 1x2x2 windows, and two 1x4x3 windows. Place a jumper on the front row two columns to the left of the front double-curved slope at the right end of the model. Add the second jumper to the rear row symmetrically. Next, orient a 1x4x3 window vertically and put it on the leftmost column of studs, then place the second vertically to the right of the first. Hold a 1x2x2 window horizontal with the flat wall in front and connect it to the right of the 1x4x3 windows on the front row. Put the second symmetrically on the rear row of the model.

79. The remaining parts of the group are two tan 1x1 slope tiles, two tan 1x1 round plates with hollow studs, and two tan minifigure telescope elements. The telescopes are round pieces occupying a 1x1x2 volume. Position a slope tile on the left stud of the front 1x2x2 window placed previously with the narrow end in front. Next, navigate to the front jumper plate five columns to the right and put a telescope on the stud of the jumper. Top the telescope with a 1x1 round plate. Place the remaining parts symmetrically along the rear row.

80. Set the main model to the side while we construct a subassembly over the next several steps. Open the second group of bricks and locate a dark orange 2x2 plate and a brown 1x4 hinge plate. Open the hinge plate fully and orient it horizontally with the swivel in the rear, then connect its right end to the back row of the 2x2 plate.

81. Get a second brown hinge plate. Open it fully, orienting it horizontally with the swivel in front, and connect its right end to the front row of the 2x2 plate.

82. Take two brown 1x10 plates and orient them horizontally. Connect one under the rear hinge plate’s left two studs and connect the other under the front hinge plate’s left two studs.

83. Locate two brown 1x6 plates. Place one horizontally to the left of the front hinge plate, then place the second behind the first.

84. Obtain a tan 1x4 plate and a brown 1x4 hinge plate. Begin by separating the two 1x10 plates placed previously by swinging them slightly apart so they form the long legs of an isosceles triangle. Next, open the 1x4 hinge plate all the way and orient it horizontally with the swivel in front. Connect its right side to the left two studs of the rear 1x10 plate. Then connect the 1x4 plate horizontally under the left end of the hinge plate. Swing the 1x4 plate so it lies vertically. The 1x4 plate will serve as the short side of the isosceles triangle.

85. Get another brown 1x4 hinge plate and open it fully. Orient it vertically with the swivel to the right, then attach the rear section to the front two studs of the 1x4 plate placed previously. Next, swing the front section of the hinge plate around to the right so it can attach to the left pair of studs of the front 1x10 plate. This may require you to adjust the positions of both the long legs of the triangle.

86. The final pieces of the group are two brown 1x6 tiles and two brown modified 1x4 tiles with studs at each end. Place a modified 1x4 tile on the left four studs of the front side of the triangle, then put a 1x6 tile to the right. Add the other parts symmetrically to the rear side of the triangle.

87. The subassembly is complete! To add it to the main build, first locate the Technic brick with dual liftarm extensions at the right end of the model, then connect the right end of the part to the left of the Technic brick. Attach the left end of the subassembly to the right of the 1x1 slope tiles on the left side of the model. The long legs of the triangle will connect to the minifigure telescope elements in the middle of the model.

The body of the flying machine is coming together. It is presently an open, boxy frame with a rectangular base and a triangular top. Over the next few steps we will begin to create connection points for the wings and tail.

88. Take the third group of bricks and gather six brown 1x1 Technic bricks with axle hole, a brown 2x4 brick, and a brown modified 2x3 plate with hole. Navigate to the right end of the model and place the

modified plate horizontally on the right two columns so the hole overhangs to the right. Return to the left end of the model. Take the 2x4 brick and connect it horizontally to the middle two rows of the vertical windows there so its left column sits on the left window. Its right column should sit in the middle of the short side of the triangle. Next, orient all the 1x1 Technic bricks with the axle holes facing left and right, then put three on the studs in front of the 2x4 brick and three behind the brick.

89. Retrieve a dark brown 1x2 tile, a brown 2x2 curved slope, three brown modified 1x4 tiles with studs at each end, and a medium nougat 2x2 half-round tile. Orient the modified 1x4 tiles vertically and connect them to the first, second and fourth columns from the left end of the model. On the third column, place the 1x2 tile vertically on the central pair of studs. Next, move over to the right end of the model and put the curved slope with its narrow end to the left so the right column of the slope sits on the left column of the modified 2x3 plate with hole placed previously. Orient the half-round tile with the rounded edge to the right and place it to the right of the curved slope.

90. Locate two tan 1x2 brackets with 2x2 side studs and two brown 1x1 brackets with 1x2 vertical side studs. Hold a 1x2 bracket with the side studs in front and put it on the pair of studs at the front left of the build, then add the 1x1 bracket two columns to the right with the side studs in front. Place the remaining brackets symmetrically in the rear.

The print instructions feature the following piece of trivia: “Leonardo da Vinci was persistent in his idea that the human body could produce enough energy to power a flying machine.”

91. Find two brown 1x1 plates and two brown 1x6 plates. Navigate to the side studs of the front left bracket placed previously and put a 1x1 plate on the lower left side stud. Hold a 1x6 plate vertically upright with the studs in front and put its top stud to the right of the 1x1 plate – the bottom stud of the 1x6 plate should connect to a bracket near the bottom of the model. Add the remaining parts symmetrically at the back of the model.

92. Collect the remaining pieces in the group, which are two brown 1x4 double-curved slopes, two brown 2x2 corner tiles, two brown 2x2 curved slopes, and two brown 1x1 plates. Take a 2x2 curved slope and orient it upright with the anti-studs facing back and the thin end at the top. Connect its top row to the top row of side studs of the front left bracket – its bottom row should connect to the 1x1 plate and top stud of the 1x6 plate placed previously. Get a 2x2 corner tile and orient it upright with the anti-studs in the rear so it feels like a smooth Braille letter J, then connect it so that the top of its right column connects to the bottom stud of the vertical 1x6 plate. Return to the top of the model and move to the right to locate the vertical 1x2 of side studs. Put a 1x1 plate on the top side stud, then orient a double -curved slope vertically upright with the curved face in front and connect it beneath the 1x1 plate so its bottom connects to another side stud. Place the remaining pieces symmetrically at the rear of the model.

93. Get the fourth group of bricks. Let’s make a part. Gather the following pieces: two brown 1x4 round plates, two brown modified 1x2 plates with pin hole at one end, a brown modified 1x2 plate with pin hole on top, a dark brown 1x2 curved slope, a tan 1x1 slope tile, a light grey 2L pin, and a brown 5L axle with stop. Construct the part as follows:
93.1. Orient the 1x4 round plates horizontally and stack them.
93.2. Orient a modified 1x2 plate with pin hole at one end horizontally, then put it on the left two studs of the part so the pin hole overhangs to the left. Connect the second modified 1x2 plate with pin hole at one end horizontally to the right so its pin hole overhangs to the right.
93.3. Orient the modified 1x2 plate with pin hole on top so the pin hole lies to the right and place it on the middle two studs of the part.
93.4. Hold the 1x2 curved slope with its thin end to the left and place it on the left two studs of the part. Then take the 1x1 slope tile and put it on the right stud of the subassembly with the thin end to the right. Lastly, hold the grey 2L pin vertically and insert the rear end of the pin into the top pin hole from the front.
93.5. The part is complete. Reorient the main model so that what was the left end now faces the front, then locate the axle hole at the top right of the front of the model. Align the axle hole with the left pin hole of the just-completed part. Hold the 5L axle with stop vertically with the stop toward you and insert it through the pin hole of the part and into the axle hole behind it. Do not push it all the way through yet – we need to add something else first!

94. Let's create another part. Collect a brown 1x4 round plate, a tan 1x2 plate, a dark grey modified 1x2 plate with tow ball on side, two brown modified 1x2 plates with pin hole at one end, and a dark brown 1x4 tile. Assemble the part as follows:
94.1. Align the 1x4 round plate horizontally and put the 1x2 plate horizontally on the left two studs.
94.2. Hold the modified 1x2 plate with tow ball so the tow ball lies to the rear and place it to the right of the 1x2 plate.
94.3. Orient a modified 1x2 plate with pin hole so the pin hole lies to the left and connect it to the left two studs of the part. Then put the second modified 1x2 plate to the right so the pin hole lies to the right.
94.4. Finish by putting the 1x4 tile horizontally on top of the part.
94.5. To add the part to the model, slot its left end into the gap three rows back from the front of the model on the right side. Align it with the axle holes in front of and to the rear of the gap, then secure it in place by pushing the 5L axle with stop all the way in so it passes through the pin hole and into the Technic brick behind it.

The subassemblies created and placed over the last two steps are moveable wing struts, which will move up and down to make the wing flap. We need to replicate the struts on the opposite side of the model and will do so over the next two steps.

95. To make the front strut, first find the following pieces: two brown 1x4 round plates, two brown modified 1x2 plates with pin hole at one end, a brown modified 1x2 plate with pin hole on top, a dark brown 1x2 curved slope, a tan 1x1 slope tile, a light grey 2L pin, and a brown 5L axle with stop. Make the strut as follows:
95.1. Position the 1x4 round plates horizontally and stack them.
95.2. Orient a modified 1x2 plate with pin hole at one end horizontally, then put it on the left two studs of the part so the pin hole overhangs to the left. Connect the second modified 1x2 plate with pin hole at one end horizontally to the right so its pin hole overhangs to the right.
95.3. Orient the modified 1x2 plate with pin hole on top so the pin hole lies to the left and place it on the middle two studs of the part.
95.4. Hold the 1x2 curved slope with its thin end to the right and place it to the right of the top pin hole. Then take the 1x1 slope tile and put it on the left stud of the subassembly with the thin end to the left. Lastly, hold the grey 2L pin vertically and insert the rear end of the pin into the top pin hole from the front.
95.5. The strut is finished! Locate the axle hole at the top left on the front of the model and align it with the right pin hole of the strut. Hold the 5L axle vertically with the stop toward you and insert it through the pin hole of the part and into the axle hole behind it, but do not push it all the way through.

96. To make the second strut, gather a brown 1x4 round plate, a tan 1x2 plate, a dark grey modified 1x2 plate with tow ball on side, two brown modified 1x2 plates with pin hole at one end, and a dark brown 1x4 tile. Create the strut as follows:
96.1. Orient the 1x4 round plate horizontally and put the 1x2 plate horizontally on the right pair of studs.
96.2. Hold the modified 1x2 plate with tow ball so the tow ball lies in the rear and place it to the left of the 1x2 plate.
96.3. Orient a modified 1x2 plate with pin hole so the pin hole lies to the left and connect it to the left two studs of the part. Then put the second modified 1x2 plate to the right so the pin hole lies to the right.
96.4. Place the 1x4 tile horizontally on top.
96.5. Slot the right end of the completed strut into the gap three rows back from the front of the model on the left side. Align it with the axle holes in front of and to the rear of the gap, then secure it in place by pushing the 5L axle with stop all the way in so it passes through the pin hole and into the Technic brick behind it.

The wing struts are now in place! Set the model aside for a moment while we create another part – this time, a frame to hold the tail.

97. Retrieve the fifth group of pieces. Find a black 2L axle and a dark brown triple axle connector – this latter piece has three axle connectors equally spaced around a central pin hole. Orient the axle connector with one protrusion pointing left and insert the 2L axle into it from the left.

98. Locate a brown 2L axle connector and two brown curved bars with 1L axle at one end and a double-sided stud at the other. Attach the axle connector to the visible section of the 2L axle placed previously. Next, orient a curved bar with the stud section horizontal to the right and the axle section curved back to the rear left. Insert the axle into the front right axle connector. Add the other curved bar symmetrically in the rear. The parts should be placed such that the stud ends point to the right.

The print instructions share the following interesting fact: “Leonardo da Vinci’s sketches show different flying machines operated by a pilot using various power mechanics – some powered by legs, some by legs as well as arms, and others even with rudders connected to the pilot’s head.”

99. Get a black 2L rubber liftarm and a dark grey axle and pin connector hub with two perpendicular axles. Hold the connector hub so one axle points right and the other points down, then insert the right-pointing axle into the left end of the 2L axle connector at the left side of the part. Then, orient the rubber liftarm horizontally with the axle holes facing up and down. Slide the right axle hole of the rubber liftarm onto the down-pointing axle of the pin connector hub.

100. Find a tan 3L axle with stud on the end and a light grey half-bush. Hold the axle vertically upright with the stud at the top and insert it into the pin hole in the center of the triple axle connector. Let it slide all the way down, then slip the half-bush onto the axle and push it to the top so it sits directly under the axle connector.

101. Retrieve the main model and orient it horizontally with the thin end of the top triangle to the right. Navigate to the dual liftarm extensions at the right end. To add the tail frame to the model, align the pin hole of the connector hub at the left end of the tail frame with the gap between the dual liftarm extensions – you will need to tilt the tail frame, so the right end rises above the left end. When aligned, push in the 2L axle protruding in front of the front liftarm extension, pinning the tail frame in place. The tail should rest with an upward slant to the right, as the rubber liftarm forces the tail to sit at an angle. The 3L axle placed previously should point down roughly 30 degrees to the vertical.

102. Once again, set the flying machine aside while we create another part. Begin by taking a dark grey 1x2 plate and a dark grey 1x2 brick with grille profile and orienting the profile brick horizontally with the vertical grille in front. Then stack the plate horizontally on top of the brick.

103. Locate a dark grey 1x2 bracket with horizontal 2x4 side studs and a dark grey 1x2 plate. Orient the bracket horizontally with the side studs in front and put it on top of the part. Then place the 1x2 plate horizontally on top of the bracket.

104. Find a dark grey 1x2 Technic brick with axle hole and stack it horizontally on top of the part.

105. Get another dark grey 1x2 bracket with horizontal 2x4 side studs and connect it to the top of the subassembly with the side studs in front.

106. Take a light grey 2x3 plate and hold it vertically upright with the studs facing you. Connect it to the middle two columns of the side studs so its bottom row sits on the bottom row of side studs.

107. Rotate the part 180 degrees so the side studs face away from you. Obtain a dark grey 1x2 inverted bracket with 2x2 side studs and hold it with the side studs facing away, then put it on top of the part.

108. Retrieve a dark grey 1x2 plate and a dark grey 1x2 brick with grille profile. Orient the brick horizontally with the horizontal grille in front and place it on top of the bracket placed previously, then add the 1x2 plate horizontally on top.

109. Find another dark grey 1x2 plate and a dark grey 1x2 inverted bracket with 2x2 side studs. Orient the bracket with the side studs facing to the rear and stack it on top of the subassembly, then place the 1x2 plate horizontally on the bracket.

110. The last piece of the group is a dark grey 1x2 curved slope. Hold it horizontally with the flat side in the rear and put it on the studs of the previously placed plate.

111. The part is complete! Its purpose is to provide a place to attach the flying machine to the display stand. To combine the part with the model, first retrieve the main assembly and orient it horizontally upside-down with the tail frame to the left. Next, orient the part horizontally with the side studs facing down and the curved slope to the right. Seven columns in from the right end of the model there is a recessed region. Connect the 2x3 plate on the underside of the part to the right three columns of the recessed region. Press the part firmly into place, connecting all the side studs of the brackets to the underside of the flying machine. This connection is very strong!

112. Let's put the model on the display stand. As a note from the set's designers explains, "The stand is used to better display and pose the model but also helps support the flying machine as you build. It helps provide better access to all sides of the model." To achieve this, first turn the model right-side-up and orient it with the tail frame to the right, then retrieve the display stand and orient it so the central shaft angles to the right. Locate the axle hole under the flying machine in the middle of the subassembly just placed and, similarly, locate the axle protruding from the top of the shaft of the display stand. Insert the axle into the axle hole. The model and the display stand are now united!

The print instructions include the following information about the flying machine: "Leonardo da Vinci's studies on the weight and structure of flying machines also mention "force", which would later be defined by Newton as the law of gravity."

113. Set the model and stand to the side while we create a subassembly which will act as a trigger for the set's function. Obtain the sixth and final group of pieces for the third bag and extract a tan 1x5 Technic plate and a dark tan 1x2 round plate. Orient the pieces horizontally and connect the 1x2 plate under the right end of the 1x5 plate.

114. Find a tan 1x2 plate and hold it vertically. Connect its front stud under the second stud from the left end of the 1x5 Technic plate.

115. Locate a second tan 1x2 plate and a tan 2x2 inverted tile. Connect the inverted tile's front right stud under the left end of the 1x5 Technic plate. Orient the 1x2 plate horizontally and connect it behind the left two studs of the Technic plate.

116. Retrieve a tan 1x3 plate and a tan 2x2 inverted tile. Position the 1x3 plate horizontally to the left of the 1x5 Technic plate, then connect the front row of the inverted tile under the overhang of the 1x3 plate.

117. Gather the following: a dark tan 1x1 round tile with upright bar, a brown 1x1 plate, a tan modified 1x1 plate with thick ring, and a tan 3x3 round corner plate. Use them to make a part:
117.1. Orient the corner plate so it forms the rear right quadrant of a circle. Next, take the modified 1x1 with thick ring and put it on the rear left stud so the thick ring protrudes to the left.
117.2. Put the 1x1 plate to the right of the modified 1x1 placed previously. Then take the 1x1 round tile and insert the bar into the back of the thick ring from behind.
117.3. To attach the part to the subassembly, first rotate it so the thick ring sits in the rear with the tile with upright bar to the right, then connect the front of the corner plate to the left studs of the back row of the subassembly. The left edges of the part and the subassembly should align.

118. Collect a dark tan 1x2 round plate, a tan 2x4 plate, and a tan 1x2 plate. Place the 1x2 plate vertically on the left column of the subassembly, then add the 2x4 plate horizontally to the right. Take the 1x2 round plate and put it horizontally on the right two studs of the subassembly.

119. Fetch a tan 1x2 plate, a tan 1x3 plate, a tan 3x3 round corner plate, and a tan 1x5 Technic plate. Position the 1x5 Technic plate horizontally on the front row of the part so that its right stud sits on the rightmost stud of the subassembly. Place the 1x3 plate horizontally to the left. Orient the round corner plate so it forms the front right quadrant of a circle and place it behind the 1x3 plate. To the right, put the 1x2 plate horizontally.

120. Locate a medium nougat 1x2 round tile, a tan 2x4 tile, and a tan 1x2 tile. Connect the 1x2 round tile horizontally to the two studs at the right end of the part. Next, take the 1x2 tile and place it vertically on the left column of the subassembly. Finally, add the 2x4 tile horizontally to the right.

121. Find a light grey 7L axle with which to combine the subassembly and the model. Orient the subassembly vertically upright with the tiled surface facing you and the round corner plates protruding to the left. Retrieve the main model and locate the hole in the floor of the model under the narrow end of the triangle. Note the pin holes on either side of the gap which sit beneath 1x4 double-curved slopes. Start by slotting the trigger into the gap from underneath. Hold it so that the protrusion to the left of the trigger aligns with the brick with grille profile to the left. This should align the axle hole of the trigger with the top pin holes. Once aligned, insert the 7L axle into the top front pin hole and push it through into the trigger and out the pin hole on the opposite side. The axle should protrude one and a half studs in front of and behind the body of the flying machine.

122. Take two light grey half-bushes. Slip one onto the section of the 7L axle protruding in front, then place the second symmetrically at the rear.

123. Gather the following: a tan 1x5 Technic plate, two tan 1x2 curved inverted slopes, two brown 1x1 Technic bricks with axle hole, four dark brown 1x2 curved slopes, and two string elements with studs at both ends. Use them to construct some rigging:
123.1. Position the 1x5 Technic plate vertically, then take the two string elements and orient them horizontally. Connect the right end of the first string to the front of the Technic plate, then connect the right end of the second string to the back of the plate.
123.2. Find two 1x2 curved inverted slopes and orient them horizontally with the lower stud to the left. Take two brown 1x1 Technic bricks with axle holes and hold them so the axle holes face the front and back, then put a brick on the left stud of each of the inverted slopes. Connect the right ends of the slopes under the left studs of the strings.
123.3. Lastly, collect the four 1x2 curved slopes. Orient two of them horizontally with the thick ends to the left. Put one of the slopes so its right end connects to the top of the left end of the front string element. Add the second symmetrically to the top of the rear string element. Next, orient a curved slope vertically with the thick end in front and attach it so the front of the slope sits on top of the right end of the front string element. Place the remaining slope symmetrically at the rear of the Technic plate.
123.4. To add the completed rigging to the main model, first flip the rigging upside-down so the anti-studs of the 1x5 Technic plate face up. Locate the axle protruding under the connector hub in the middle of the tail frame and slide the axle hole in the middle of the 1x5 Technic plate onto it. Next, take the part at the left end of the front string element and rotate it so the string is coming out the top and the slopes are on the left and right. Slide the axle hole of the Technic brick onto the part of the 7L axle protruding in front of the model, in front of the trigger mechanism placed previously – the string should sit above the axle. Connect the part at the left end of the rear string symmetrically at the back of the flying machine.

124. The final piece of the bag is a light grey half-bush. Slide it on the axle which holds the 1x5 Technic plate.

The print instructions feature the following fact: “Codex on the Flight of Birds, published in 1505, contains Leonardo da Vinci’s studies and investigations on flying.”

You have reached the end of the third bag. The flying machine is three-quarters complete and now has places to which we will soon attach wings and a tail. The trigger mechanism is in place. Pulling the trigger presently causes the tail to beat down, but we will expand its functionality in the next section of the build.

125. Collect the fourth and final bag of the set and obtain the first group of pieces. Find two black 2L axles, four light grey 3L thin liftarms, and two light grey axle and wire connectors. (These latter pieces occupy the same volume as a 2L liftarm and have an axle hole at one end and a fork at the other with only a thin gap. These parts are sometimes used to secure wires in place.) Use them to create two of the following part:
125.1. Orient two thin liftarms horizontally with the pin holes facing up and down. Stack one on top of the other, then take a 2L axle and insert it into the right axle hole to connect the liftarms.
125.2. Take an axle and wire connector and orient it horizontally with the axle hole at the left end facing up and down. Slide the axle hole onto the upper section of the axle at the right end of the part.
125.3. Repeat the previous steps to obtain two parts. Let’s add them to the model. Take one and orient it vertically upright with the free axle hole at the top and the axle and wire connector at the

bottom and in front. Rotate it roughly thirty degrees so the top is to the right, then slide the axle hole at the top onto the section of the 9L axle protruding in front of the build – the axle is coming out of the build roughly halfway along the front of the flying machine near the bottom of the fuselage. Connect the second part symmetrically to the rear.

Put the model to the side. Steps 126 through 131 are concerned with the construction of two identical subassemblies. You may either construct them both at once by duplicating the steps below or in series by returning to step 126 upon completion of the first part.

126. Find a tan 1x5 Technic plate and a dark tan 1x2 round plate. Orient the pieces horizontally and put the 1x2 plate on the right two studs of the 1x5 plate.

127. Bring a medium nougat 1x3 round plate. Place it horizontally at the left end of the 1x5 plate so it overhangs to the left by one column.

128. Locate a dark grey modified 1x2 plate with tow ball at one end, a dark tan 1x2 round plate, and a tan 1x1 round plate with hollow stud. Orient the modified 1x2 plate horizontally with the tow ball to the left and connect it to the left two studs of the 1x3 round plate placed previously, then put the 1x1 round plate to the right. Add the 1x2 round plate horizontally to the right side of the part.

129. Get a tan 1x5 Technic plate and place it horizontally on top of the part so their right ends align.

130. Gather a dark orange 1x3 tile, a dark orange 1x2 curved slope, and a dark orange 1x1 half round tile. Orient the half-round tile with the curved side to the right and put it on the rightmost stud of the subassembly. Add the 1x3 tile horizontally to the left. Hold the curved slope with the narrow end to the left and put it to the left of the previous part.

131. Find a dark grey 1x6 Technic link – this piece is six studs long, with an axle in the middle connecting two small hoops. Orient the link vertically upright with the holes of the hoops facing left and right, then push the bottom hoop onto the tow ball at the left end of the part. It should be secured in place but pivot freely about the joint.

If you have chosen to build the parts in parallel, you will now have two identical parts. If not, please return to step 126 and repeat the above to obtain a second part.

132. Take one of the two parts. Locate the right-facing tow ball on the front right wing strut. Connect the free end of the link to the tow ball so the part hangs beneath it and to the right. Next, turn the rest of the part so that the tiled surface faces toward you. Navigate to the protruding section of the 9L axle and push the part onto it via the axle holes in the middle of the 1x5 Technic plates. Attach the second part symmetrically to the rear of the flying machine.

133. Put the display to the side again as we build a wing. Retrieve the next group of parts and find a tan 1x5 Technic plate and a light grey modified 1x2 plate with single finger at one end. Orient the 1x5 plate horizontally and place the 1x2 plate at the right end with the finger to the right.

134. Fetch a tan 1x4 plate and a tan 1x5 Technic plate. Put the 1x4 plate horizontally on the left two studs of the part so it overhangs two columns to the left, then connect the 1x5 plate horizontally under the overhang.

135. Find a dark tan 1x2 round plate and two tan modified 1x2 plates with upright bar on one side. Put the 1x2 round plate horizontally on the left two studs of the 1x4 plate placed previously. Next, orient the modified 1x2 plates horizontally with the bars in the rear, then place one to the right of the 1x2 round plate and the other on the right two studs of the part.

136. Gather a tan 2x2 plate, a medium nougat 1x3 round plate, a tan modified 1x1 plate with clip, a brown modified 1x2 plate with clip at one end, and a dark orange 1x3 tile. Construct a part as follows:
136.1. Orient the 1x3 round plate horizontally. Take the 2x2 plate and connect its back row on top of the right two studs of the 1x3 plate.
136.2. Hold the modified 1x2 plate so the clip is to the left, then connect it under the front row of the 2x2 plate.

136.3. Orient the modified 1x1 plate with the clip in front and put it on the left stud of the back row.
136.4. Put the 1x3 tile horizontally on the back row of the part.
136.5. Add the part to the build by connecting its front row to the left two studs of the subassembly.

137. Get two tan 1x5 Technic plates and a black 1L bar with tow ball. Orient the plates horizontally. Put one on the right side of the subassembly so their right ends align. Place the second to the left of the first. Hold the bar vertically upright with the tow ball at the top and insert it into the clip to the left of the second plate placed previously. Push the piece all the way down so the tow ball sits against the top clip.

138. Bring a medium nougat 1x2 round tile, a dark orange 1x6 tile, and a dark orange 1x1 half-round tile. Put the 1x2 tile horizontally to the right of the tow ball. Add the 1x6 tile horizontally two columns to the right, avoiding the axle hole to the right of the 1x2 round tile. Finally, place the 1x1 half-round tile on the rightmost stud of the subassembly with the curved side to the right.

139. Locate a dark orange 1x6 Technic link with perpendicular stoppers. Hold it horizontally with the hoop at the right end facing up and down and connect it to the tow ball at the left end of the subassembly.

140. Rotate the part lengthways so the tiles face away from you and the anti-studs face toward you. Find a brown curved bar with 1L axle at one end and a double-sided stud at the other, and a brown hinge cylinder with two fingers at one end. Hold the hinge cylinder horizontally with the fingers to the left and at the top and bottom. Attach it to the protruding finger at the right end of the subassembly. Next, orient the curved bar with the axle horizontal and pointing left so that the bar curves forward. Insert the axle into the hole at the right end of the hinge cylinder. Lastly, click the hinge cylinder back one position to angle the bar correctly.

141. Next, we will make a part. Gather a brown hinge cylinder with two fingers, a light grey hinge cylinder with one finger, a light grey 3L axle, and a brown curved bar with 1L axle at one end and a double-sided stud at the other. Assemble the part as follows:
141.1. Hold the curved bar with the axle horizontal and to the left so the bar curves forward. Orient the hinge cylinder with two fingers horizontally with the fingers to the left and at the top and bottom, then insert the axle of the curved bar into the axle hole of the hinge cylinder.
141.2. Orient the hinge cylinder with one finger horizontally with the finger to the right and connect it to the hinge cylinder with two fingers.
141.3. Take the 3L axle and insert it into the axle hole of the left hinge cylinder.
141.4. To attach the part to the assembly, first push the axle back until it points to the rear (equal to four clicks of the hinge). Then, insert the axle into the axle hole three columns in from the right end of the subassembly.

142. The wing is complete (at least, for now!). To attach it to the main assembly, first reorient it by flipping it over lengthways so the bars are on top and point toward you while the curved bars curve away from you. Then, rotate it so the curved bars are in front of you and the link is in the back. Navigate to the left end of the model and locate the tow ball two rows in from the left near the bottom along the front side. Connect the free end of the link to the tow ball. Next, locate the axle hole in the front of the wing three studs forward of the link. Align the axle hole with the pin hole at the end of the wing strut to the left of the wing. Take a brown 5L axle with stop and orient it horizontally with the stop to the left. Insert the axle from the left through the pin hole and into the axle hole in the wing. Then, align the right side of the wing with the wing strut to the right and push the axle all the way through to secure the wings and struts in place.

143. Again, set the model to the side while we construct the opposite wing. Retrieve the third group of bricks and find a tan 1x5 Technic plate and a light grey modified 1x2 plate with single finger at one end. Orient the 1x5 plate horizontally and place the 1x2 plate at the right end with the finger to the right.

144. Fetch a tan 1x4 plate and a tan 1x5 Technic plate. Put the 1x4 plate horizontally on the left two studs of the part so it overhangs two columns to the left, then connect the 1x5 plate horizontally under the overhang.

145. Find a dark tan 1x2 round plate and two tan modified 1x2 plates with upright bar on one side. Put the 1x2 round plate horizontally on the left two studs of the 1x4 plate placed previously. Next, orient the modified 1x2 plates horizontally with the bars in the front, then place one to the right of the 1x2 round plate and the other on the right two studs of the part.

146. Gather a tan 2x2 plate, a medium nougat 1x3 round plate, a tan modified 1x1 plate with clip, a brown modified 1x2 plate with clip at one end, and a dark orange 1x3 tile. Construct a part as follows:
146.1. Orient the modified 1x2 plate so the clip is to the left. Take the 2x2 plate and connect its back row onto the studs of the 1x2 plate.
146.2. Connect the 1x3 round plate horizontally under the front row of the 2x2 plate so it protrudes to the left by one stud.
146.3. Orient the modified 1x1 plate with the clip in the rear and put it on the left stud of the front row.
146.4. Put the 1x3 tile horizontally on the front row of the part.
146.5. Add the part to the build by connecting its back row to the left two studs of the subassembly.

147. Get two tan 1x5 Technic plates and a black 1L bar with tow ball. Orient the plates horizontally. Put one on the right side of the subassembly so their right ends align. Place the second to the left of the first. Hold the bar vertically upright with the tow ball at the top and insert it into the clip to the left of the second plate placed previously. Push the piece all the way down so the tow ball sits against the top clip.

148. Bring a medium nougat 1x2 round tile, a dark orange 1x6 tile, and a dark orange 1x1 half-round tile. Put the 1x2 tile horizontally to the right of the tow ball. Add the 1x6 tile horizontally two columns to the right, avoiding the axle hole to the right of the 1x2 round tile. Finally, place the 1x1 half-round tile on the rightmost stud of the subassembly with the curved side to the right.

149. Locate a dark orange 1x6 Technic link with perpendicular stoppers. Hold it horizontally with the hoop at the right end facing up and down and connect it to the tow ball at the left end of the subassembly.

150. Rotate the part lengthways so the tiles face away from you and the anti-studs face toward you. Find a brown curved bar with 1L axle at one end and a double-sided stud at the other, and a brown hinge cylinder with two fingers at one end. Hold the hinge cylinder horizontally with the fingers to the left and at the top and bottom. Attach it to the protruding finger at the right end of the subassembly. Next, orient the curved bar with the axle horizontal and pointing left so that the bar curves forward. Insert the axle into the hole at the right end of the hinge cylinder. Lastly, click the hinge cylinder back one position to angle the bar.

151. Make a part. Gather a brown hinge cylinder with two fingers, a light grey hinge cylinder with one finger, a light grey 3L axle, and a brown curved bar with 1L axle at one end and a double-sided stud at the other. Assemble the part as follows:
151.1. Hold the curved bar with the axle horizontal and to the left so the bar curves forward. Orient the hinge cylinder with two fingers horizontally with the fingers to the left and at the top and bottom, then insert the axle of the curved bar into the axle hole of the hinge cylinder.
151.2. Orient the hinge cylinder with one finger horizontally with the finger to the right and connect it to the hinge cylinder with two fingers.
151.3. Take the 3L axle and insert it into the axle hole of the left hinge cylinder.
151.4. To attach the part to the assembly, first push the axle back until it points to the rear (equal to four clicks of the hinge). Then, insert the axle into the axle hole three columns in from the right end of the subassembly.

152. The subassembly is complete. To attach it to the main assembly, reorient it vertically so the curved bars are in the rear and the link is in front. Navigate to the left end of the model and locate the tow ball two rows in from the left near the bottom along the back side of the model. Connect the free end of the link to the tow ball. Next, locate the axle hole in the front of the wing three studs forward of the link. Align the axle hole with the pin hole at the end of the wing strut to the left of the wing. Take a brown 5L axle with stop and orient it horizontally with the stop to the left. Insert the axle from the left through the pin hole and into the axle hole in the wing. Then, align the right side of the wing with the wing strut to the right and push the axle all the way through to secure the wings and struts in place.

153. The remaining pieces of the group are two light grey hinge cylinders with one finger, two brown hinge cylinders with two fingers, and two brown curved bars with 1L axle at one end and a double-sided stud at the other. Use them to create two identical parts:
153.1. Hold a hinge cylinder with two fingers vertically upright with the fingers underneath at the front and back. Orient a hinge cylinder with one finger vertically upright with the finger at the top and click it into the two-fingered cylinder.
153.2. Take a curved bar and orient it with the axle vertically upright at the bottom with the bar curving to the left. Insert the axle into the axle hole of the top hinge cylinder.
153.3. Repeat to get a second part. To place the first part, begin by holding the curved bar and then turning the bottom of the hinge to the left by three clicks. Then orient the part with the axle hole of the click hinge facing left and connect it to the protruding section of axle on the right side of the rear wing. Add the second part symmetrically to the front wing.

154. Collect the fourth group of pieces. Set aside the model while we construct another part. Find a black 2L axle and two brown 2L axle connectors and orient them horizontally. Insert the 2L axle into the right end of an axle connector, then insert the exposed part of the axle into the left end of the second axle connector.

155. Find two more black 2L axles and insert one into each end of the subassembly.

156. Locate two brown angled axle and pin connectors. (The angle between the ends is 157.5 degrees, but they are the only angled connectors in the group, so you should be able to distinguish them easily.) Orient the first with the pin hole facing front and back and the right end horizontal with the left end angling up, then connect the right end of the connector to the axle at the left of the subassembly. Add the other symmetrically to the right of the part.

157. Take two light grey 3L axles and insert one each into the free ends of the angled axle connectors placed previously.

158. Get two tan 2L thin liftarms and orient them vertically with the axle holes facing left and right. Slide the rear axle hole onto the right 3L axle placed previously, then slide the other onto the left axle symmetrically.

159. Retrieve two light grey wheels with center groove and slip them onto the axles at each end of the part.

160. Bring two more tan 2L thin liftarms and orient them vertically with the axle holes facing left and right. Slide the rear axle hole of the first liftarm onto the protruding axle at the right end of the build. Add the second symmetrically to the left end.

161. Find two black 2L axles and orient them horizontally. Insert the right end of one axle into the front axle hole of the left thin liftarm placed previously, but do not push it through. Add the second symmetrically to the right of the subassembly.

162. The part is complete! Retrieve the main model and orient it vertically with the tail in the rear. To connect the part to the model, navigate to the lower middle of the front of the flying machine. Locate the pins to the left and right which protrude in front of the model. Take the subassembly and attach it to the pins via the pin holes in the center of the bent axle connectors – the ends of the part should angle up, and the thin liftarms which flank the grooved wheels should overhang in front of the model.

The print instructions include the following information about da Vinci: “Leonardo da Vinci was inspired and fascinated by winged animals while studying the possibilities of human mechanical flight, and he hoped to replicate these animals’ movements with his inventions.”

163. Gather the following pieces with which to make a part: two dark orange 1x2 curved slopes, two tan 1x1 Technic bricks with pin holes, two tan 1x2 inverted curved slopes, and a dark tan string element with end studs. The string element comes in a bundle secured by a piece of masking tape – remove the tape before continuing. Construct the part as follows:
163.1. Extend the string horizontally before you.

163.2. Take an inverted curved slope and orient it horizontally with the lower stud to the left. Connect the left end of the string element to the right stud of the inverted slope. Next, take a 1x1 Technic brick and place it on the left stud of the inverted slope so the pin hole faces front and back. Find the other inverted slope and Technic brick and place them symmetrically at the right end of the string.
163.3. Get a curved slope and orient it horizontally with the thin end to the right. Place it on the left end of the part. Take the other curved slope and place it symmetrically at the right end of the string.
163.4. The part is complete and can be added to the model. This step is tricky and complex, requiring you to thread the string around and through several components of the model. To start, remove the model from the display stand and orient it upside down with the tail in the rear. Locate the two pins protruding from the lower front of the model on the wing struts – this is where we will attach the ends of the string subassembly. Move to the left pin and attach one end of the string subassembly here so that the tan inverted curved slope lies to the left and the dark orange curved slope lies to the right. This is important because the pin hole is not centered in the part, instead lying closer to the slope than the inverted slope. Attach the other side of the string symmetrically to the right pin. Next, take the string and thread it over the fronts of the grooved wheels above the string ends. To the left of the left grooved wheel is an axle jutting to the left – push it in to keep the string in place. Do the same on the right side of the model. Finally, stretch the string back and thread it through the light grey wire and axle connectors.

164. Take a dark tan modified 1x1 round tile with upright bar. Locate the trigger towards the rear of the model and find the hollow stud at the front of the trigger. Loop the string behind the hollow stud, then insert the bar of the modified tile into the stud. This holds the string in place.

The set's function is now complete! Pulling back on the trigger causes the wings and tail to beat down in a flapping motion. Return the model to the display stand for the final steps in which we will attach the fabric elements to the wings.

165. Orient the model horizontally with the tail to the right. Collect the three tan fabric elements – there are two wings and a tail piece. The tail piece has three holes, while the wings are larger and have five holes each. All three elements have dark tan printing on top mimicking stitches. Orient the parts with the printing on top. Take the tail element and orient it with the frilled edge to the right. Align the holes in the fabric with the studs on the tail frame and gently place it there. Next, identify the left wing element by orienting the wings with the frilled edge to the right and taking the one with the wider end in front. Locate the left-pointing bars on the front edge of the rear wing and thread them through the pair of holes on the left edge of the wing, then align the other three holes with the studs on the curved bars that lie to the right. Place the right wing symmetrically at the front.

166. Gather nine dark tan modified 1x1 round tiles with upright bars. Insert the bar of each modified tile into one of the studs that sit in the holes in the wings and tail. The modified tiles serve to secure the fabric elements in place.

Congratulations, you have finished the flying machine! The model is a remarkable piece of Lego engineering, faithfully recreating the ornithopter designed by da Vinci. Its color scheme of tans and browns contribute to the illusion that the model is built of wood.

167. Retrieve the very last group of pieces, which contains the parts for a Leonardo da Vinci minifigure. Take the dark blue minifigure legs and orient them with the feet facing forward. Next, take the dark blue minifigure torso and hold it with the arms in front. Connect the torso to the top of the legs. Find the white minifigure beard element and place it around the neck at the top of the torso so that the beard hangs down in front of the torso, then put the light nougat minifigure head element on the neck, securing the beard in place. Finally, collect the white hair element and put it on top of the head with the long hair flowing down the back of the torso. Now we can equip the minifigure with a pair of accessories! Take the white feather plume element and clip it into the minifigure's right hand, then locate the tan 2x2 tile and clip it into the minifigure's left hand.

The Leonardo da Vinci minifigure is an excellent representation of the famed artist and polymath. He is an old man, with a flowing white beard and long white hair that tumbles down his back, as depicted in his most famous self-portrait. Beneath the beard, his mouth is set in a half-smile that suggests he has just had an idea and is keen to get to work. He wears dark blue robes with a fur trim that extends from the collar all the way down to his knees. Under the robes he sports a dark red tunic. In his hands

he holds a white feather plume representing a quill and a tan 2x2 tile printed with the designs for the flying machine.

There is a pair of studs under the front of the flying machine to which the Leonardo da Vinci minifigure can be connected for display.

The print instructions include this final note from the designers: “The model was designed so that the trigger can be activated in at least three different ways – on the stand, while held in one hand, and while held with two hands (one on the trigger, the other one holding the model. One of the design challenges was to figure out where to place the trigger for the flapping function so that the builders’ hands don’t interfere with any parts of the mechanism or strings.”

There are no adverts at the end of the instruction booklet.

Thank you for building this set – we hope you enjoyed it!

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