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# Künstler, Kunsthandwerker und Luftfahrtpionier

Leonardo da Vinci (1452-1519) ist der unbestrittene Meister der Innovationen aus der Zeit der Renaissance. Bis heute wird da Vinci völlig zu Recht für seine Kreativität und seinen Einfallsreichtum gefeiert. Seine Zeitgenossen schätzten den Paradiesvogel jedoch vor allem wegen seiner visionären Fähigkeiten und seiner grenzenlosen Wissbegierde. Er widmete sein Leben dem Studium der Kunst, der Anatomie von Mensch und Tier, der Physik und des „Maschinenbaus“ und verschob die Grenzen des Machbaren in diesen Feldern mit beispielloser Leidenschaft und Entschlossenheit und großem handwerklichen Geschick. Meisterwerke wie die beiden Gemälde *Mona Lisa* und *Das letzte Abendmahl* bescherten ihm weltweiten Ruhm. Ähnliche Bewunderung genießt er jedoch auch dafür, dass er sein ganzes Leben lang danach eiferte, den Menschen in die Lüfte zu bringen.





„Das größte Vergnügen ist  
die Erkenntnis.“

– *Leonardo da Vinci*



# Das Nachahmen des Vogelflugs

Obwohl laut Überlieferung keines der von Leonardo da Vinci erfundenen Fluggeräte zu dessen Lebzeiten verwirklicht wurde, erwiesen sich seine Ideen, Konstruktionen und Studien einige Jahrhunderte später dennoch als wertvolle Grundlagen für die ersten funktionierenden Flugzeuge. Der Ornithopter oder auch Schwingenflügler ist eines seiner berühmtesten Werke, doch all seine Erfindungen basieren auf derselben Idee, dass eine einzelne Person ein mechanisches Fluggerät mit schlagenden Flügeln steuert. Dieser Pilot musste seine Körperkraft nutzen, um an Hebeln und Schnüren zu ziehen oder zu drücken und so die Flügel nach oben und unten schlagen zu lassen.



**„Einfachheit ist die höchste Stufe der Vollendung.“**

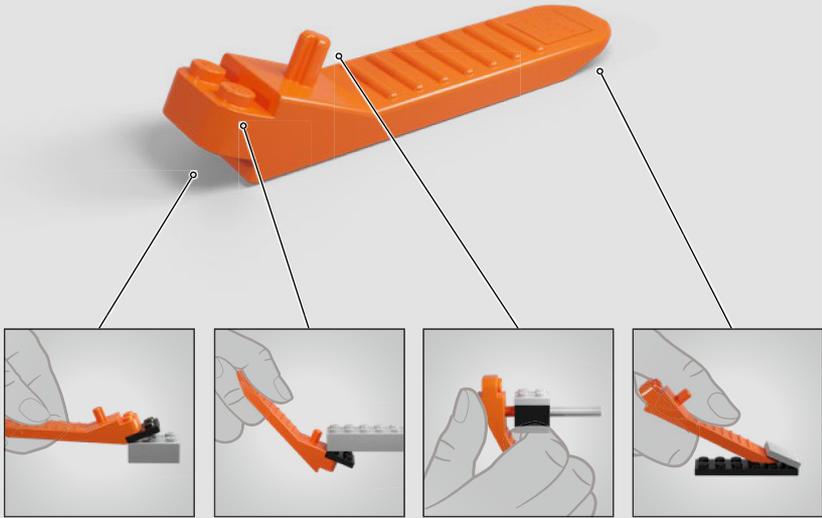
*- Leonardo da Vinci*

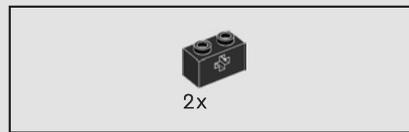


## Anmerkungen des LEGO® Designteams

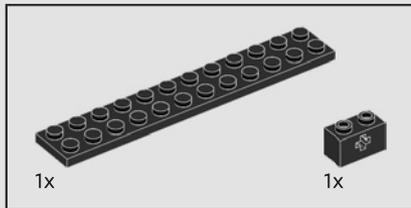
„Genau an diesem Punkt setzten wir mit unserem Entwurf an. Wir wollten eine Maschine mit beweglichen Teilen bauen, die alle über eine einzige Schnur miteinander verbunden waren und sich durch Ziehen an dieser Schnur bewegen ließen. So einfach dieses Modell auch erscheinen mag, so groß war dennoch die erforderliche LEGO® Ingenieursleistung. Das Modell soll so aussehen, als wäre es aus Holz, Leinen und Schnur gefertigt worden. Der Schwanz und die Flügel besitzen ein Gerippe aus LEGO Steinen, und die Stoffflügel sind mit einem Muster bedruckt. Die Stoffschnur als wichtigsten Bestandteil des Flügelschlagmechanismus in das Modell zu integrieren, war für uns die kniffligste Herausforderung! Die mechanischen Teile des Modells bleiben unverdeckt, um einerseits die funktionalen Elemente und Leonardos Vision zu feiern und andererseits unsere eigene Interpretation des ursprünglichen Designs zu verwirklichen.“

**Antica Bracanov**  
LEGO® Senior Designer

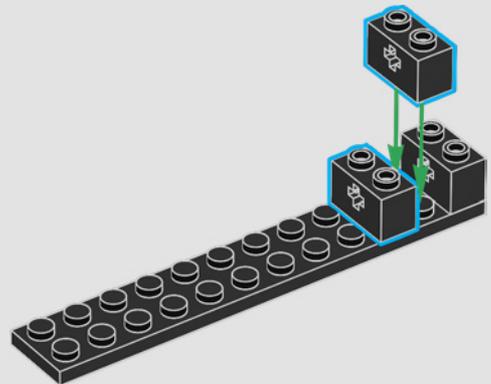
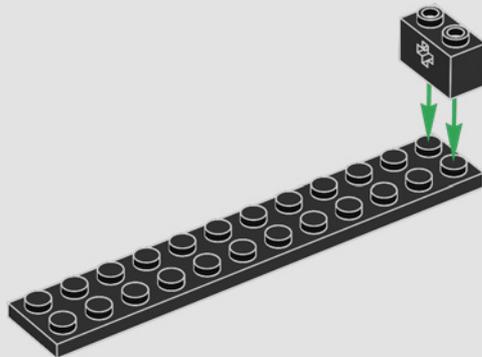


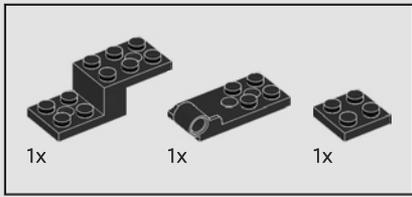


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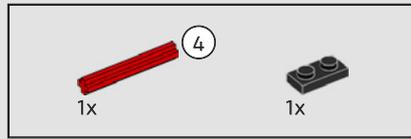
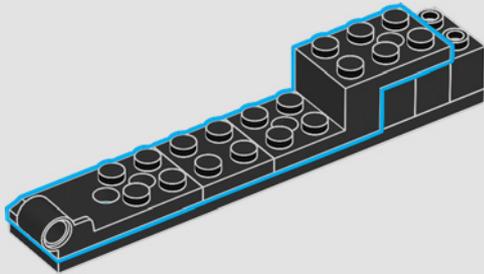


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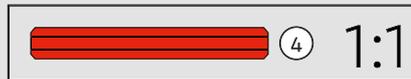
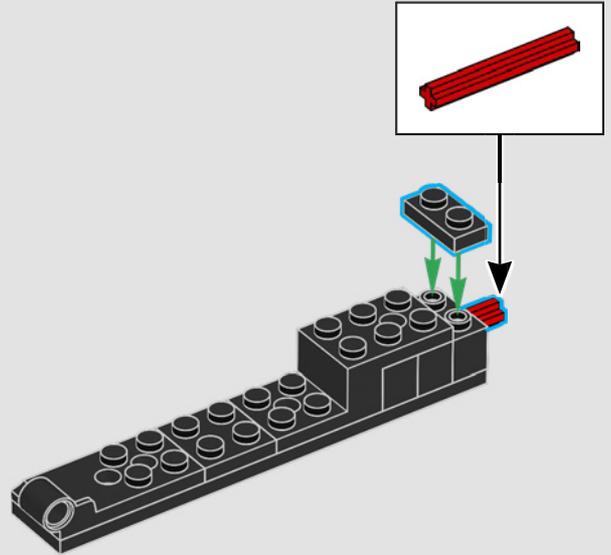




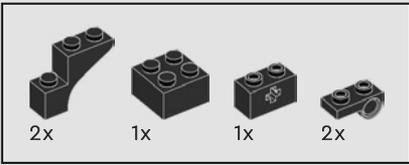
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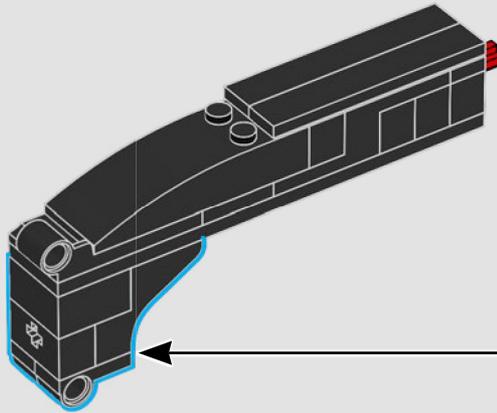
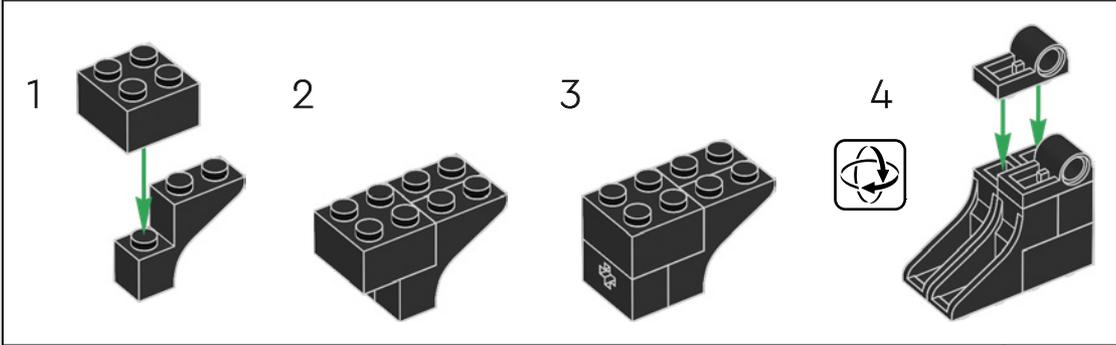
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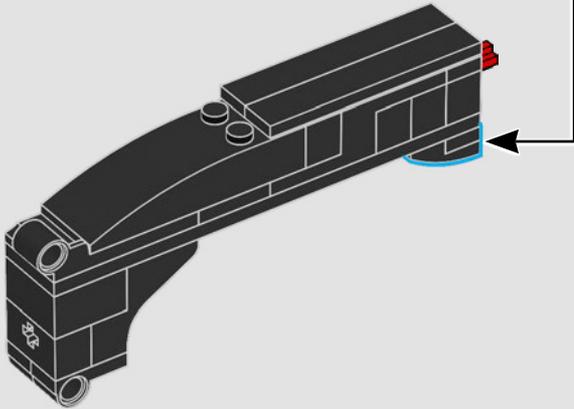
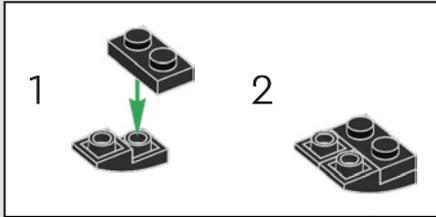


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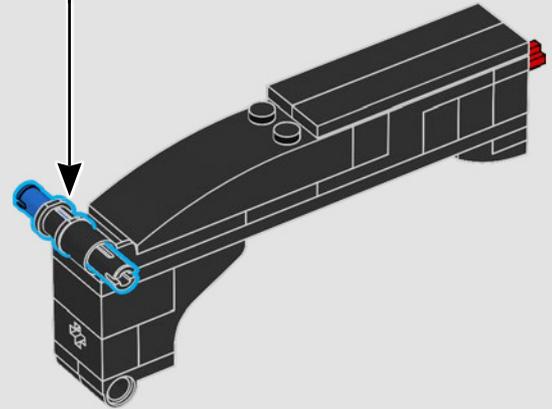
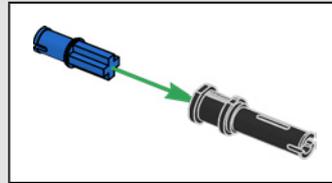


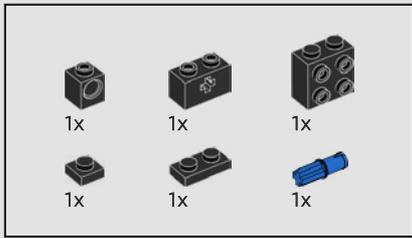


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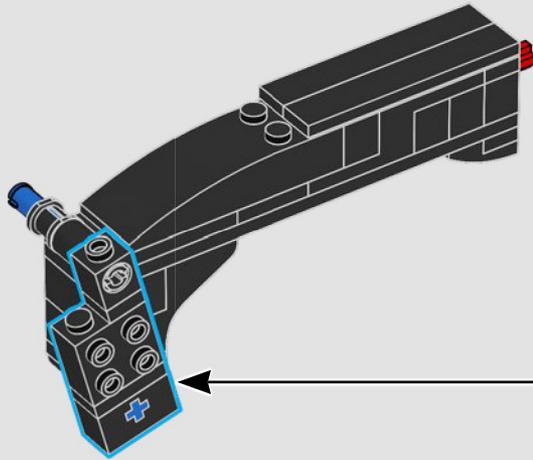
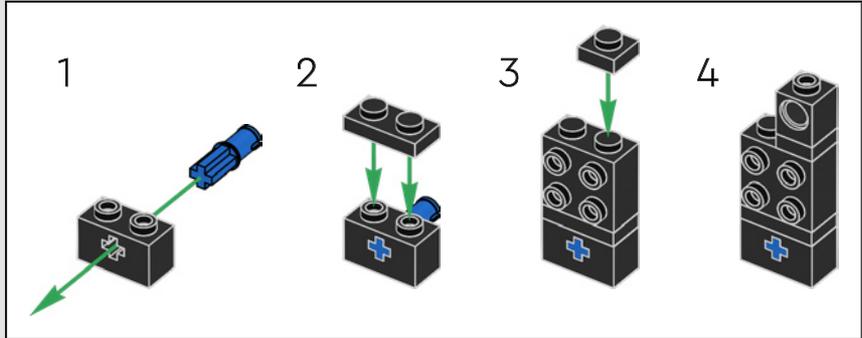


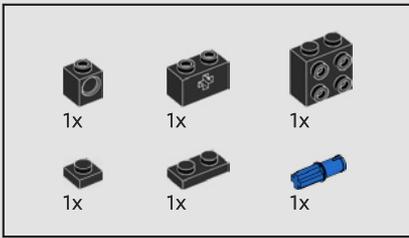
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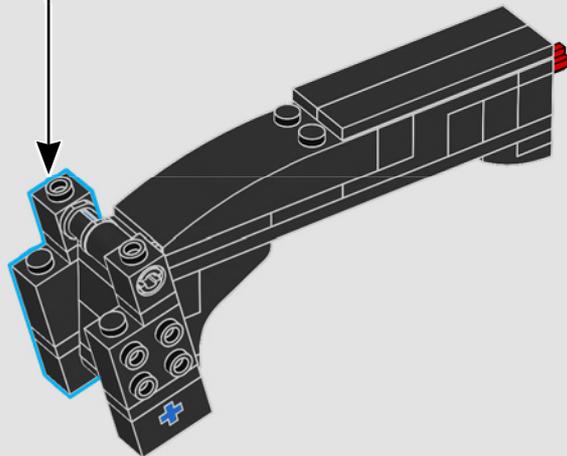
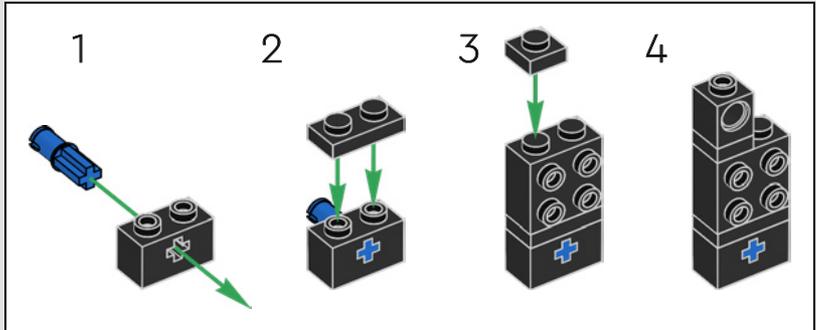


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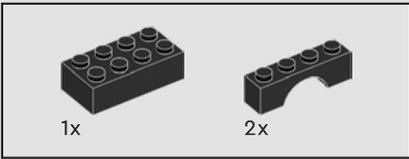




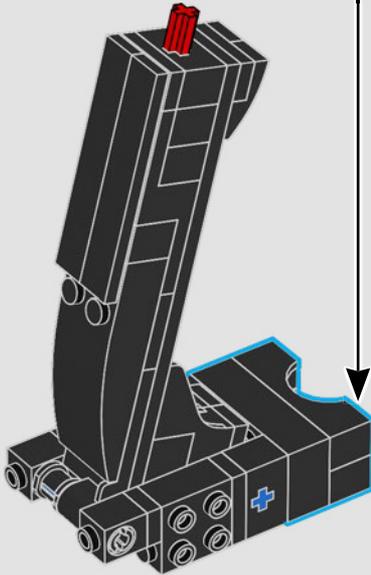
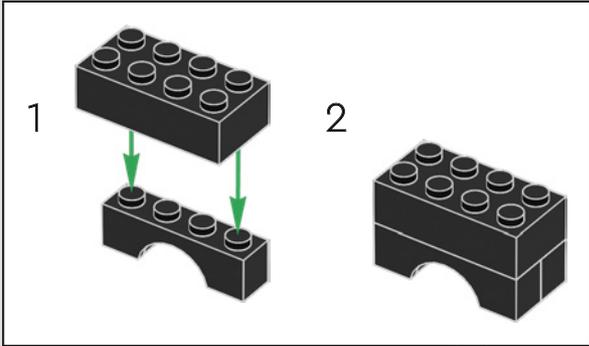
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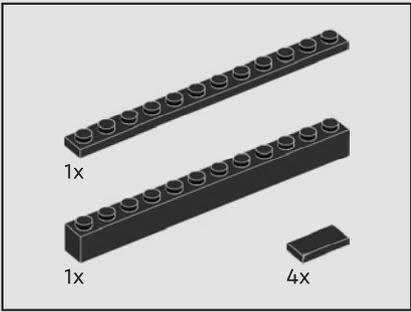


Einer von da Vincis Flugapparaten mit dem Namen *Il Grande Nibbio* war nicht nur einem Milan nachempfunden, sondern auch nach diesem Greifvogel benannt.

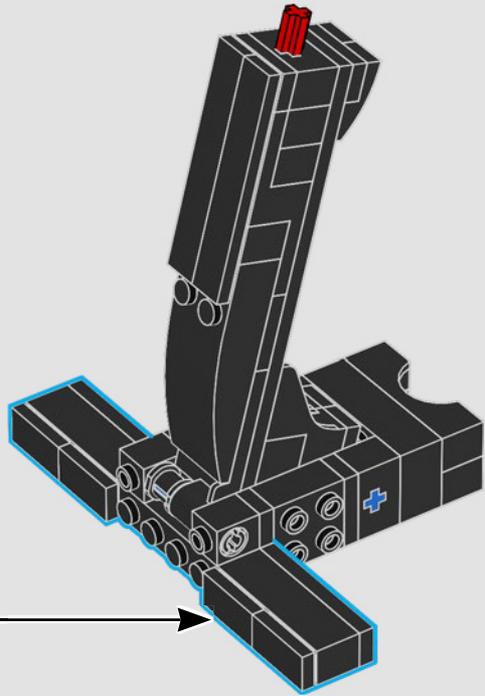
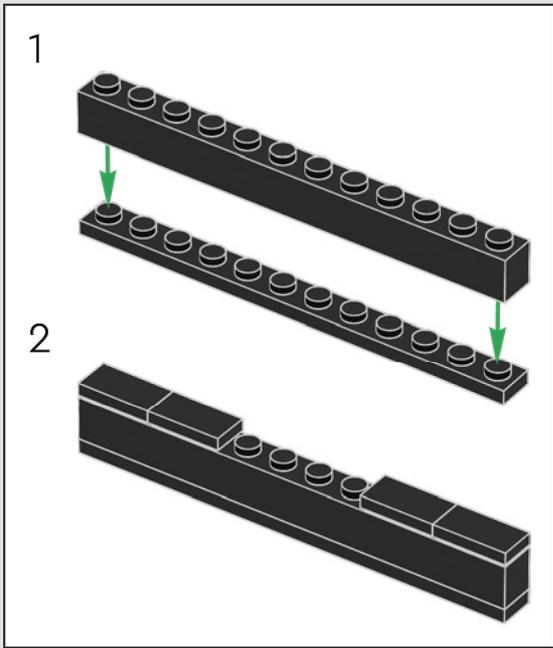


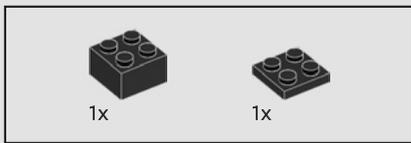
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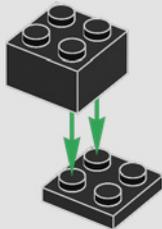


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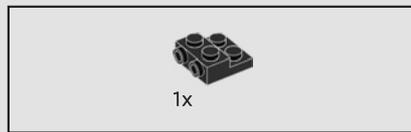
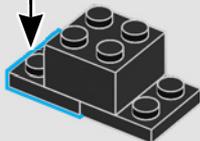




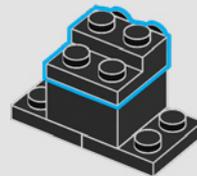
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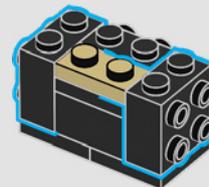
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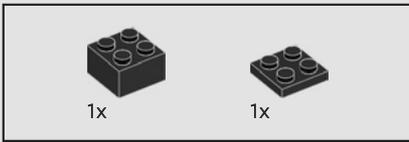


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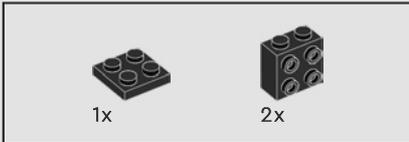
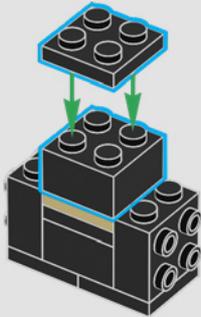


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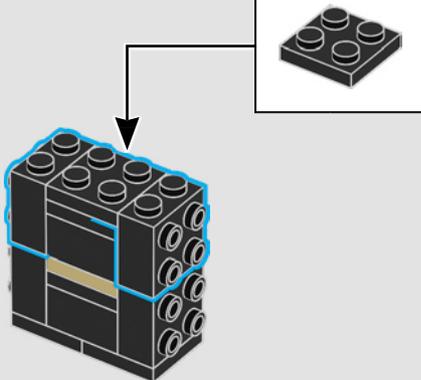




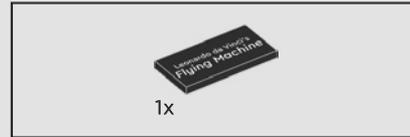
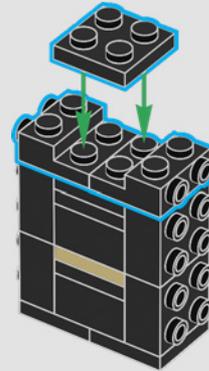
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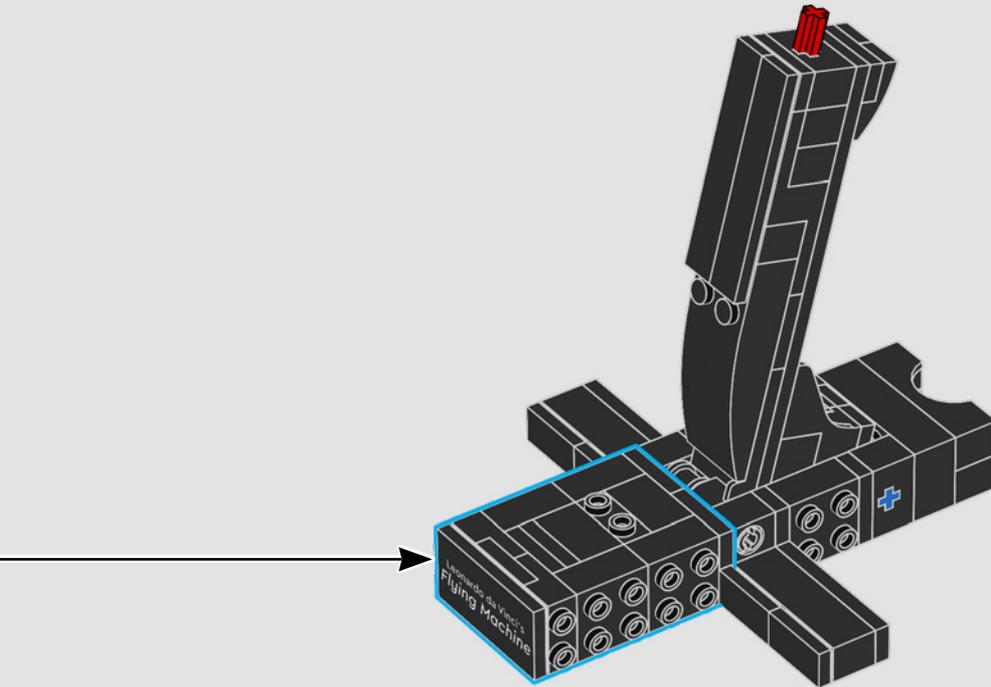
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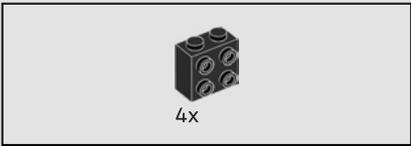




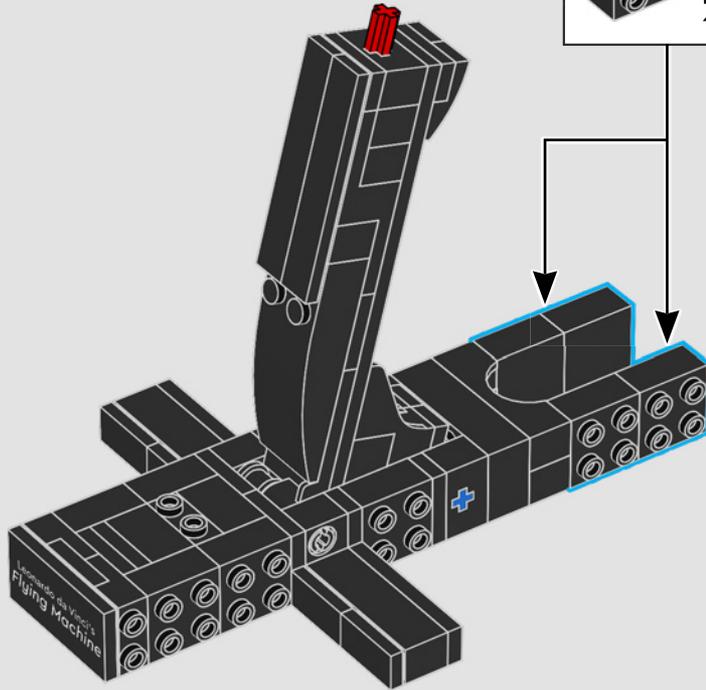
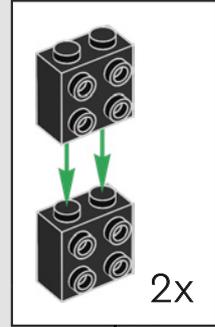
Bekanntlich schrieb da Vinci seine Notizen von rechts nach links.  
Diese Spiegelschrift ließ sich nur mithilfe eines Spiegels entziffern.

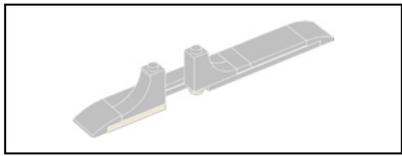
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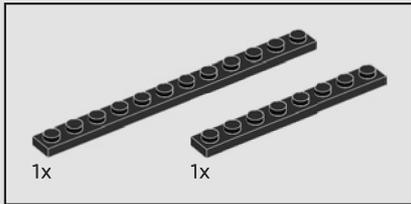


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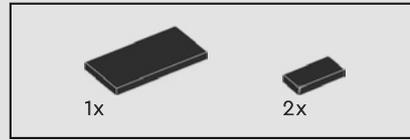
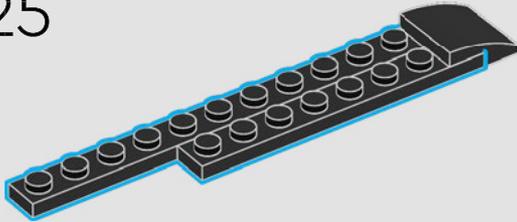




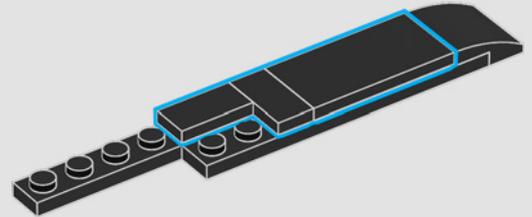
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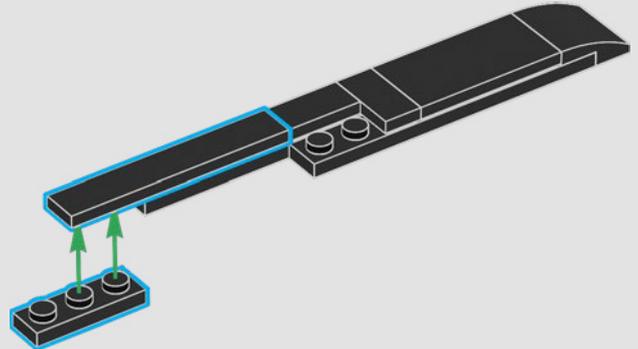
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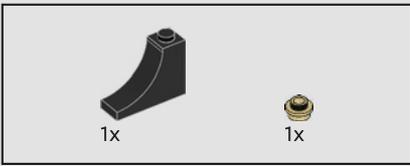


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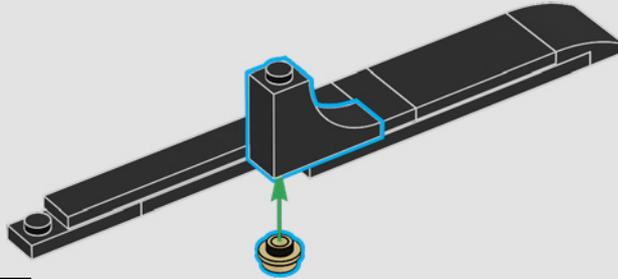


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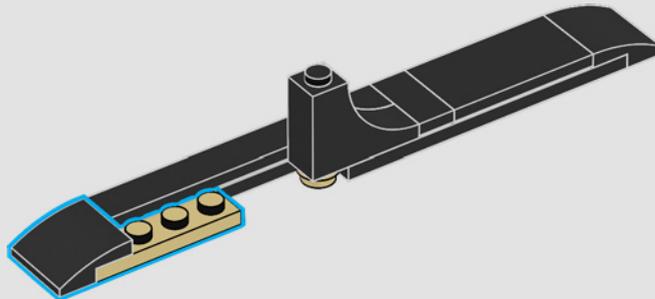


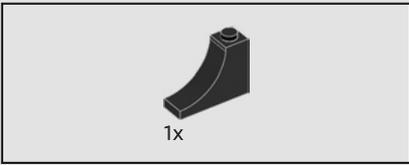


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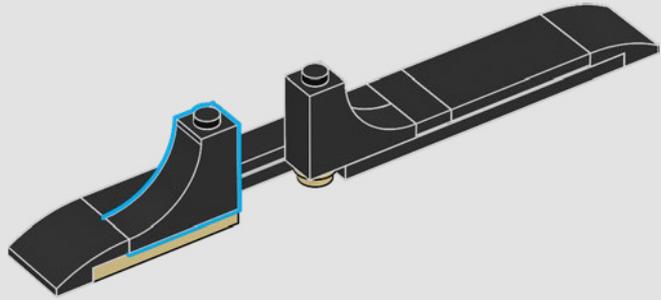


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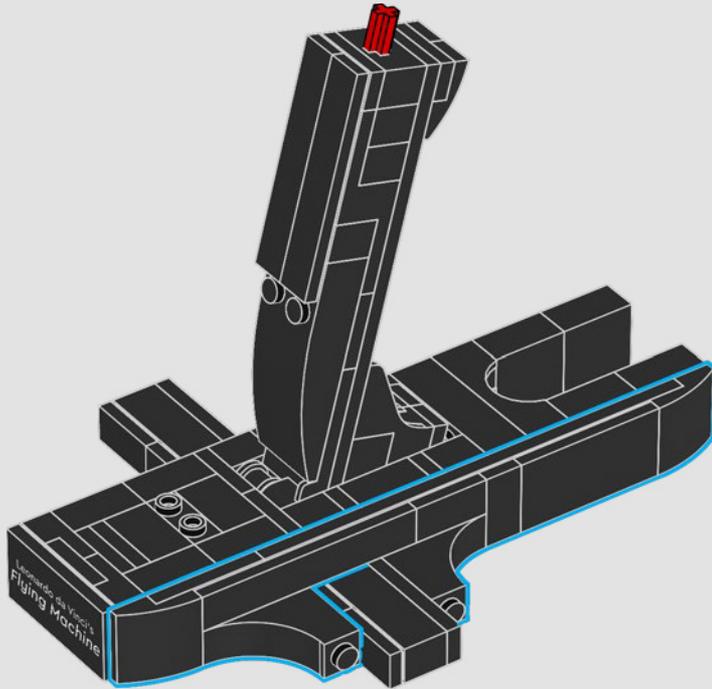


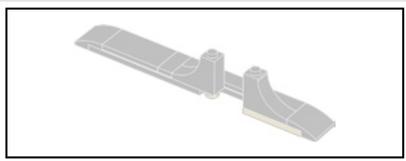


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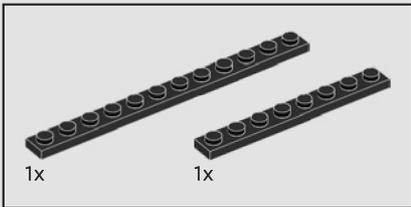


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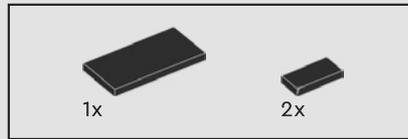
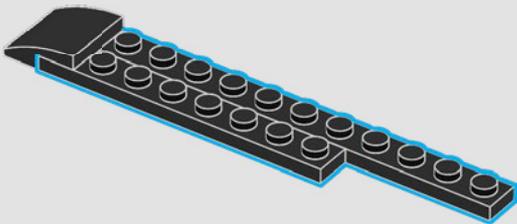




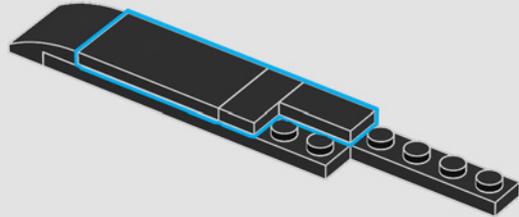
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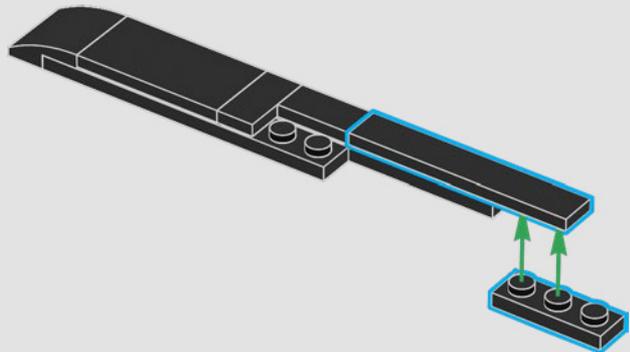
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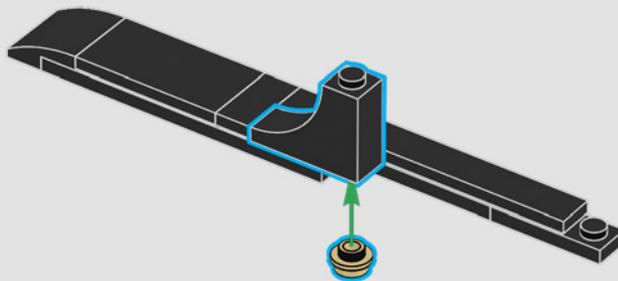


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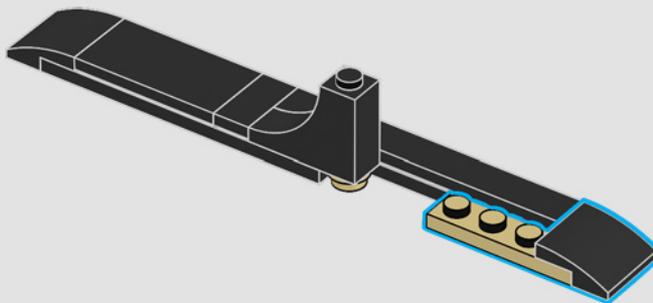


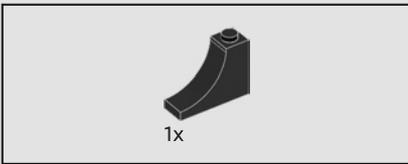


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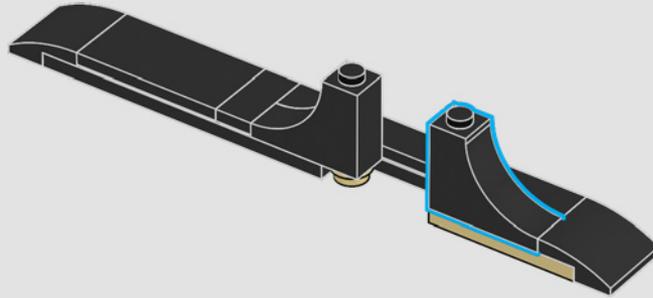


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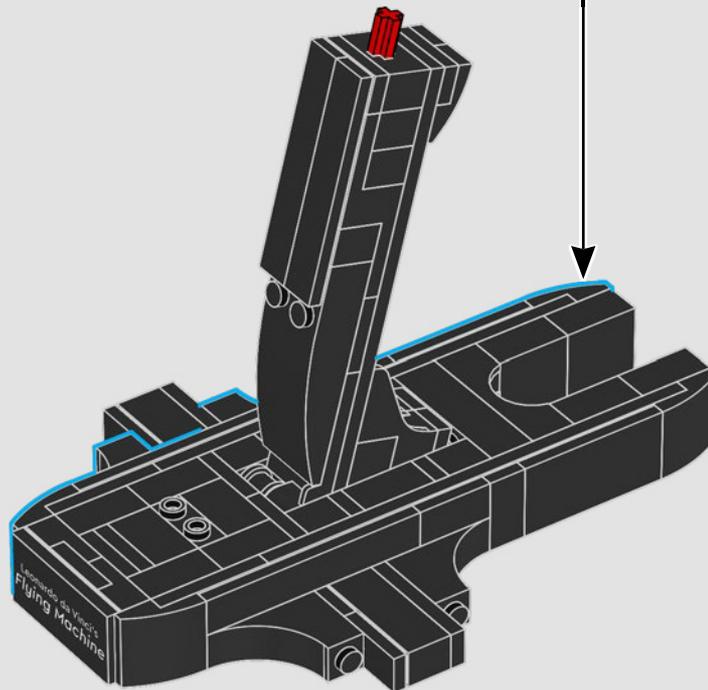




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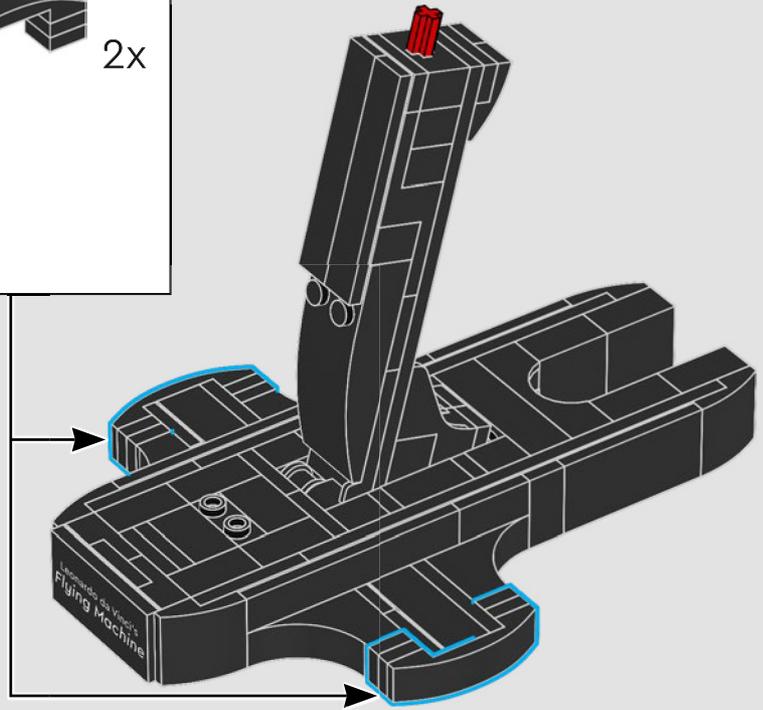
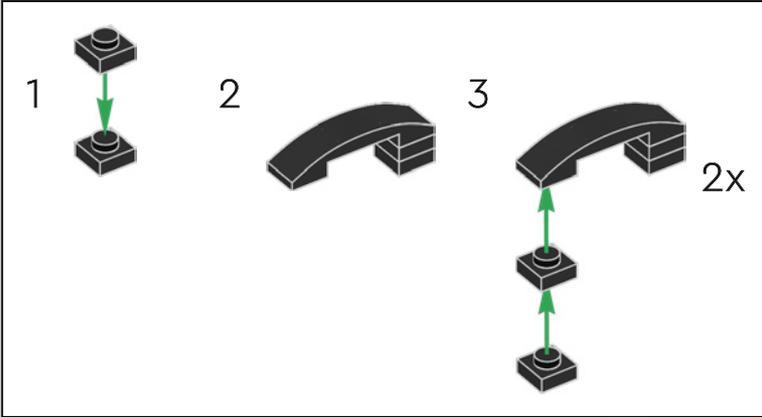




Bekanntlich hat Leonardo da Vinci mehr als 35.000 Wörter über das Fliegen und Flugapparate verfasst und mehr als 500 Skizzen zu seinen Erfindungen angefertigt!

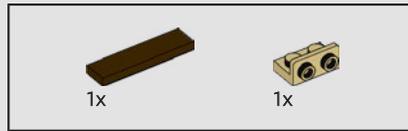
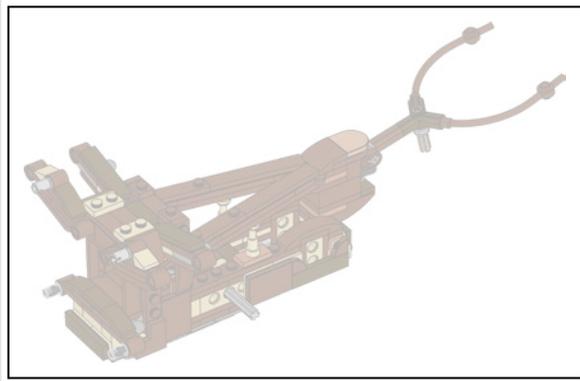
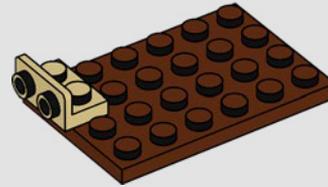


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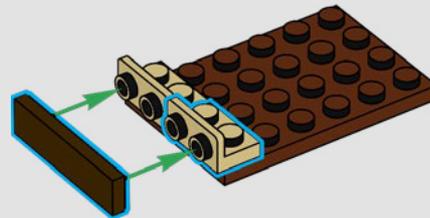


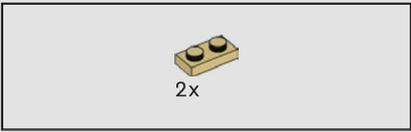


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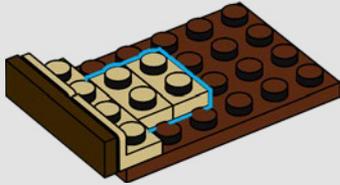


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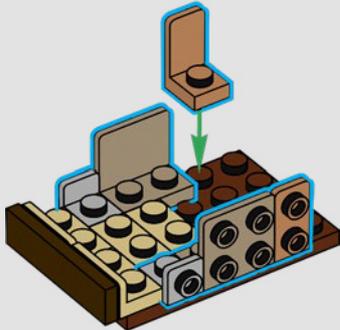




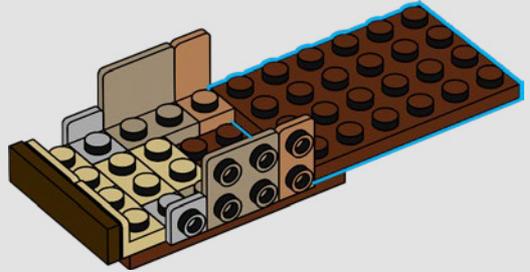
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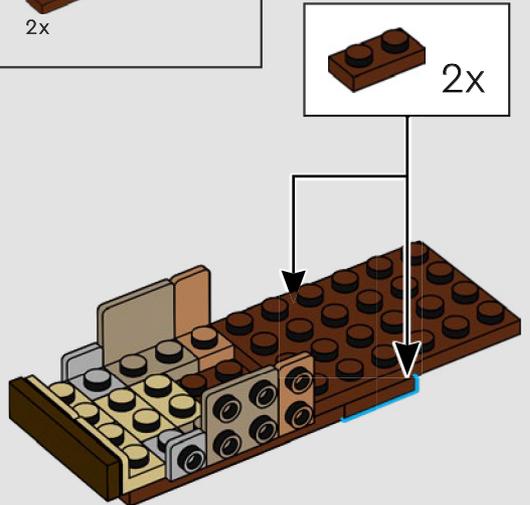
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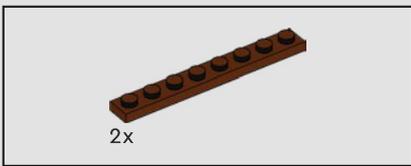


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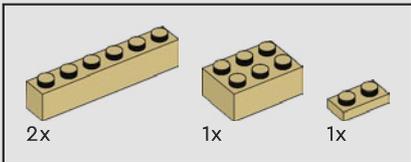
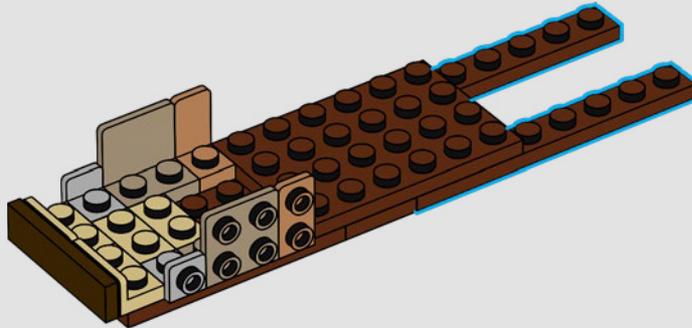


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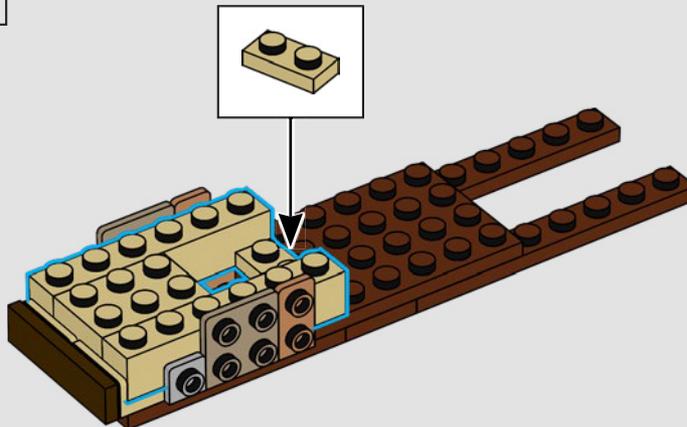




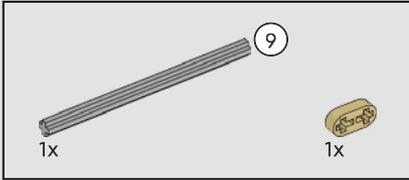
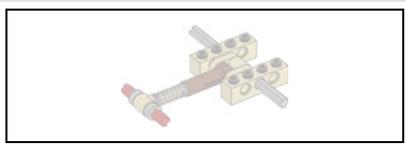
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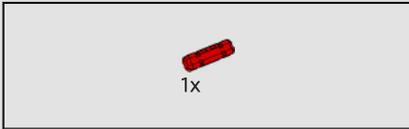
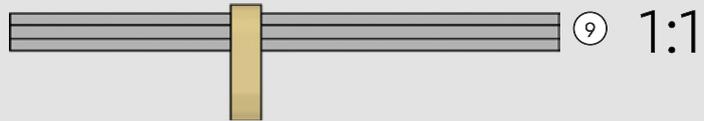
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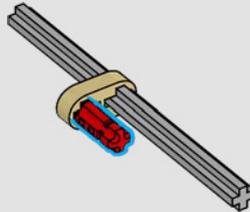




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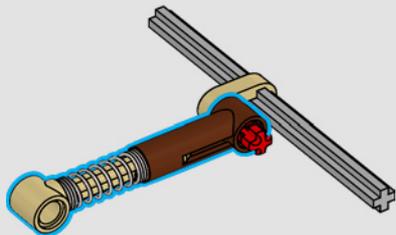


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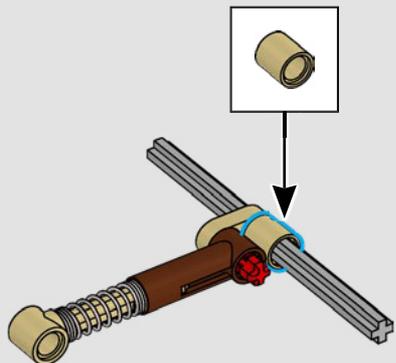




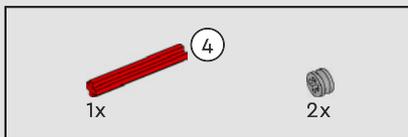
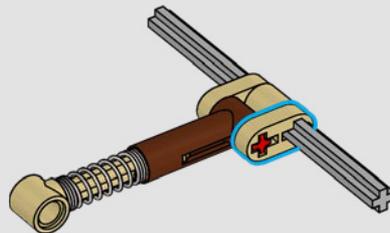
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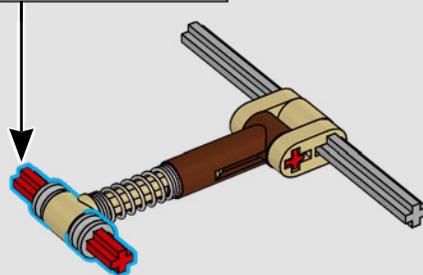
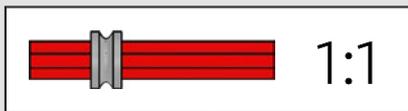
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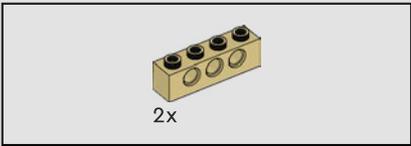


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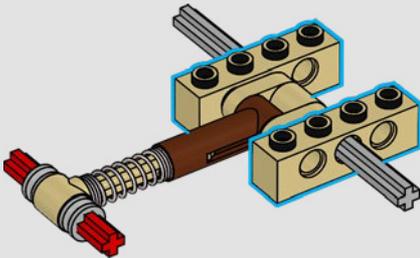


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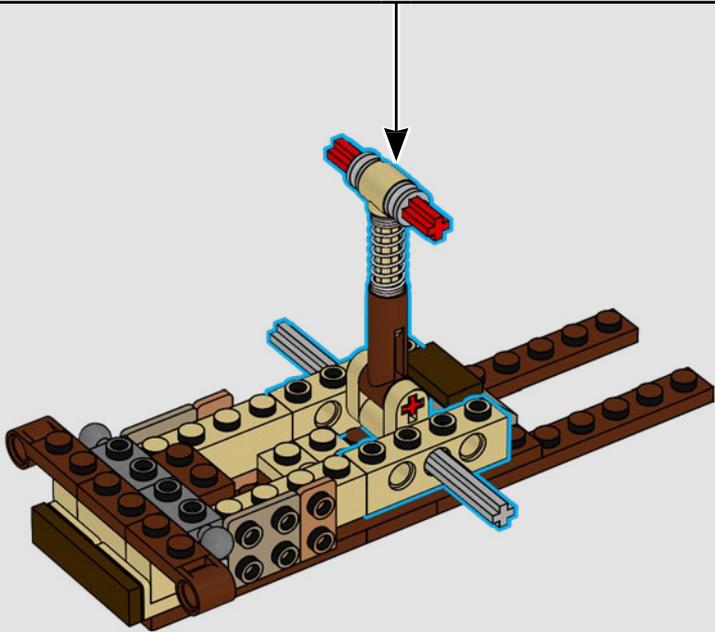




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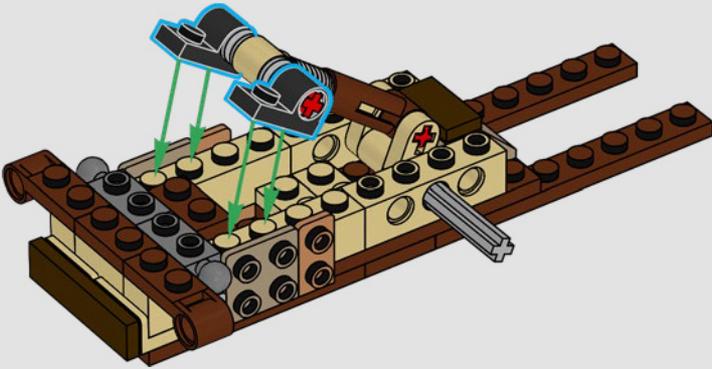


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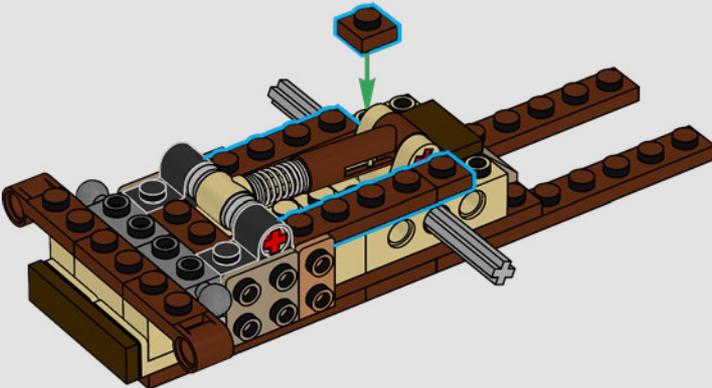




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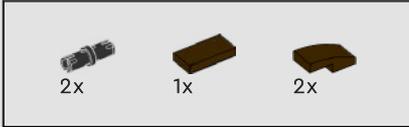
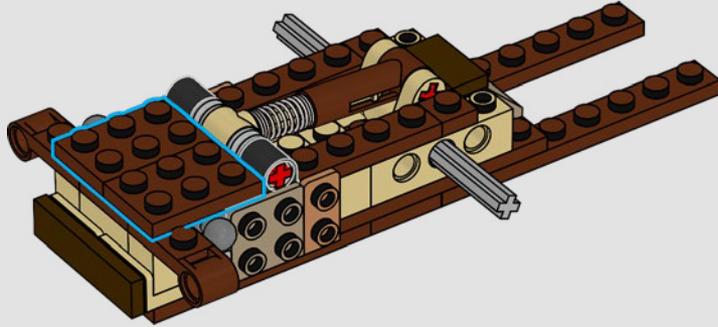


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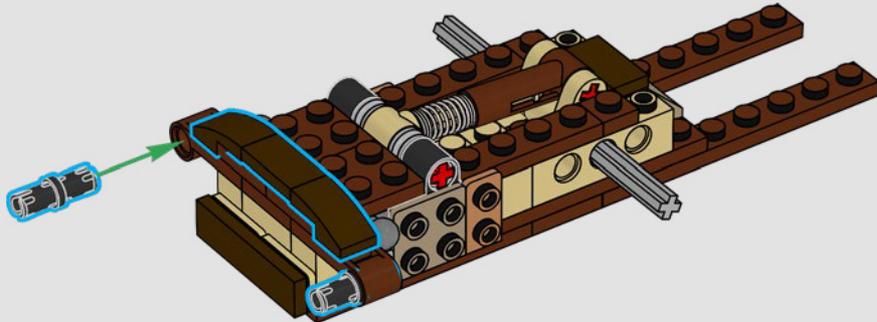


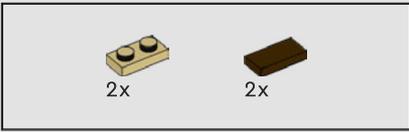


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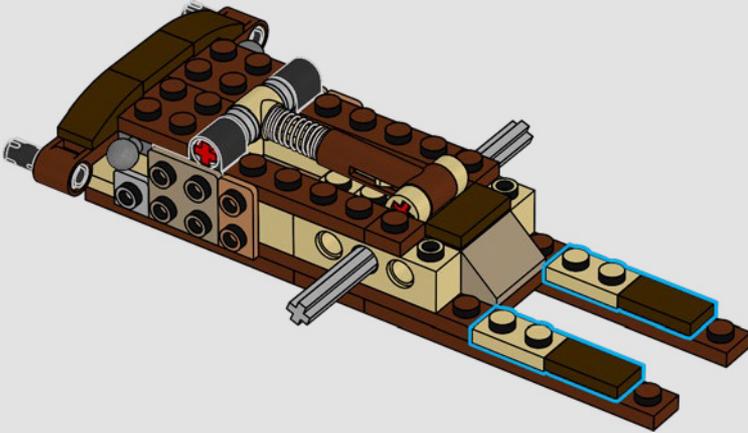


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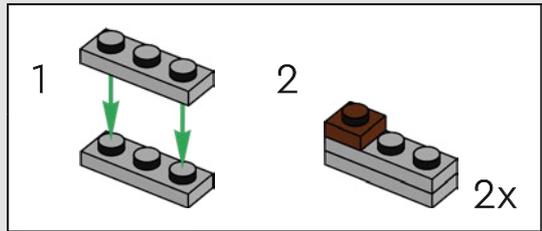
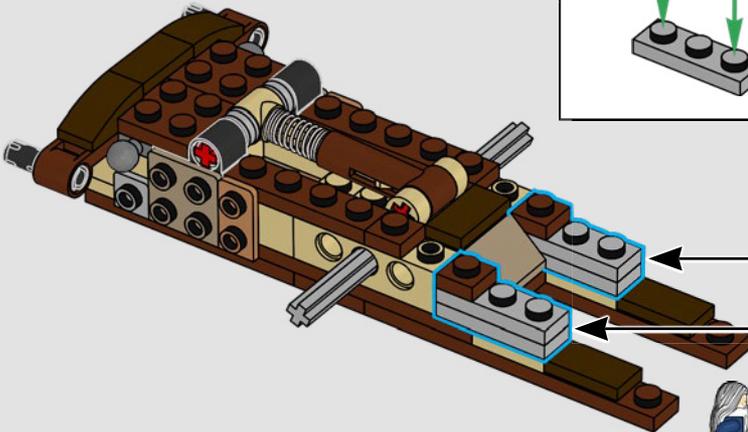


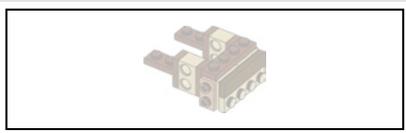


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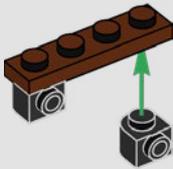


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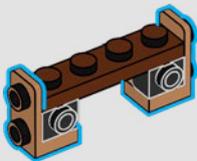




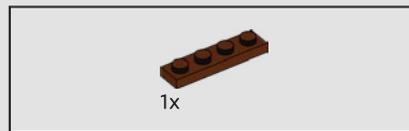
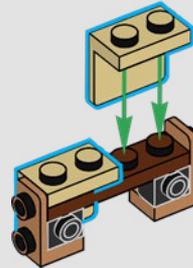
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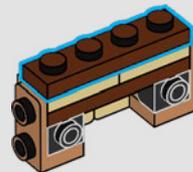
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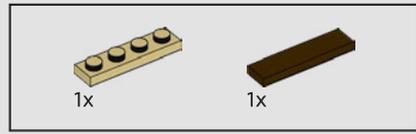
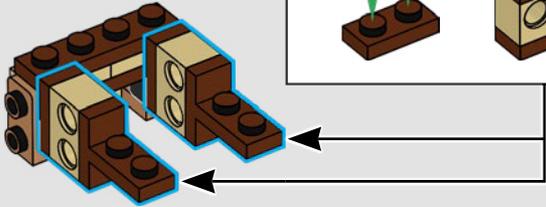
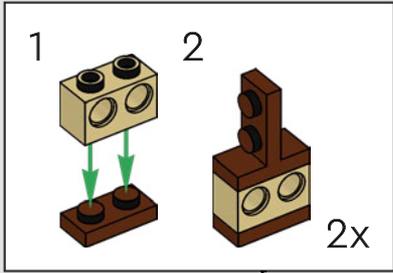


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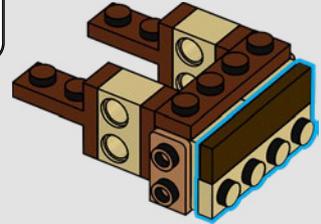




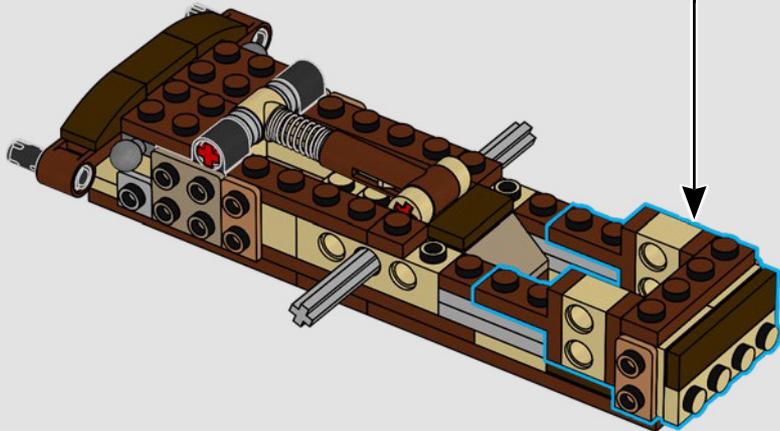
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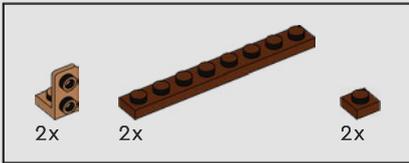
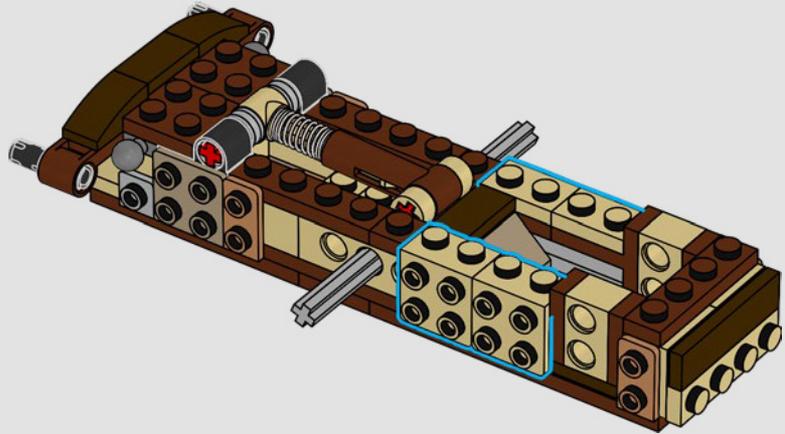


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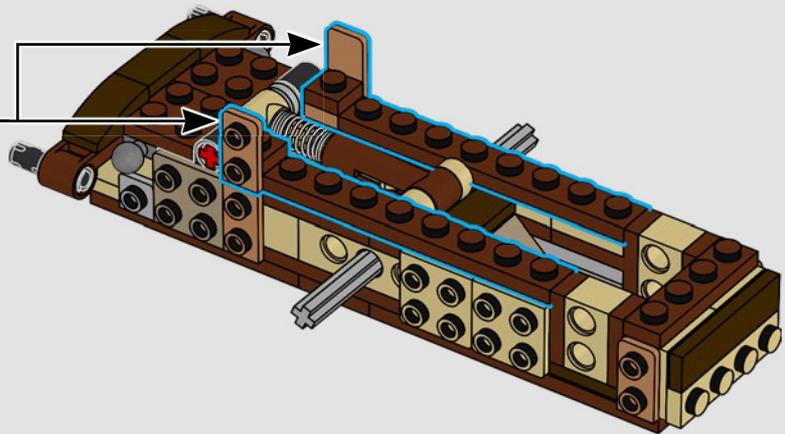
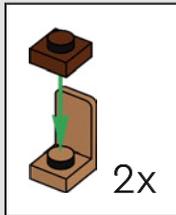




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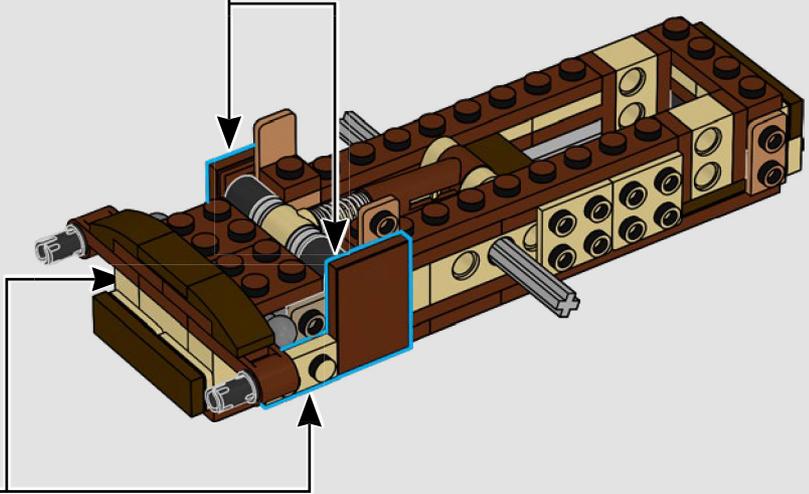
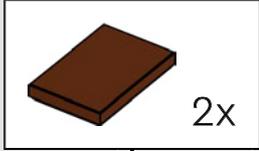


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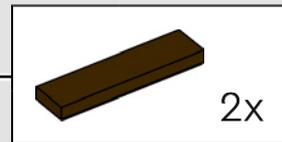
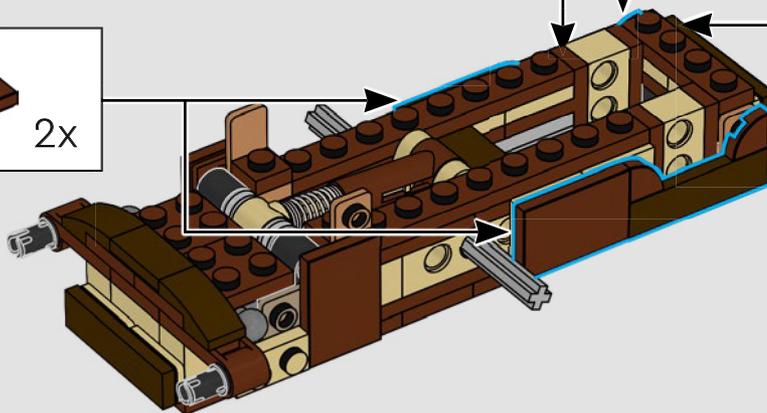


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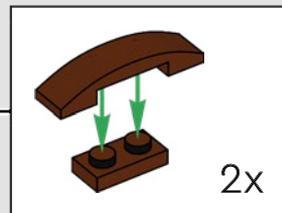
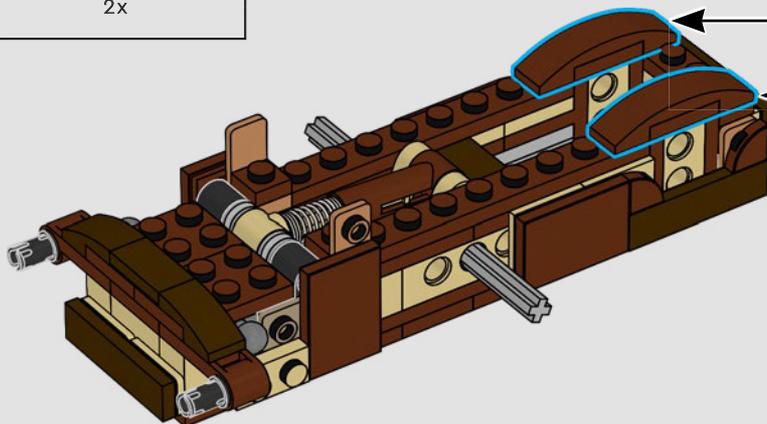


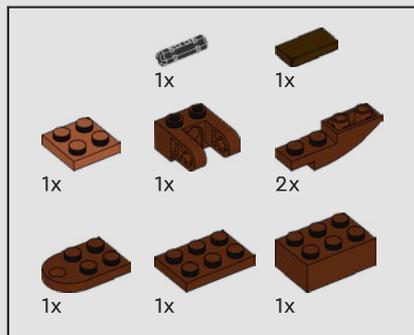


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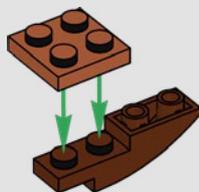
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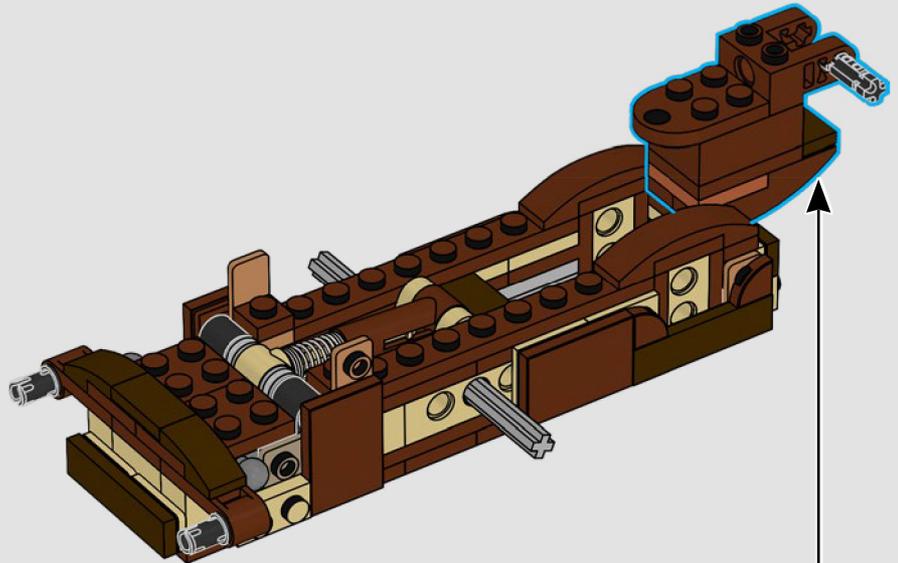


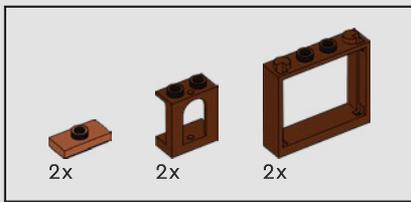
Leonardos Ornithopter war für Flüge in geringer Flughöhe konzipiert.  
Ein Freund des Künstlers bot sich als Testpilot an, allerdings mit  
überschaubarem Erfolg. Die Maschine stürzte ab, und da Vincis Freund  
brach sich ein Bein.

5

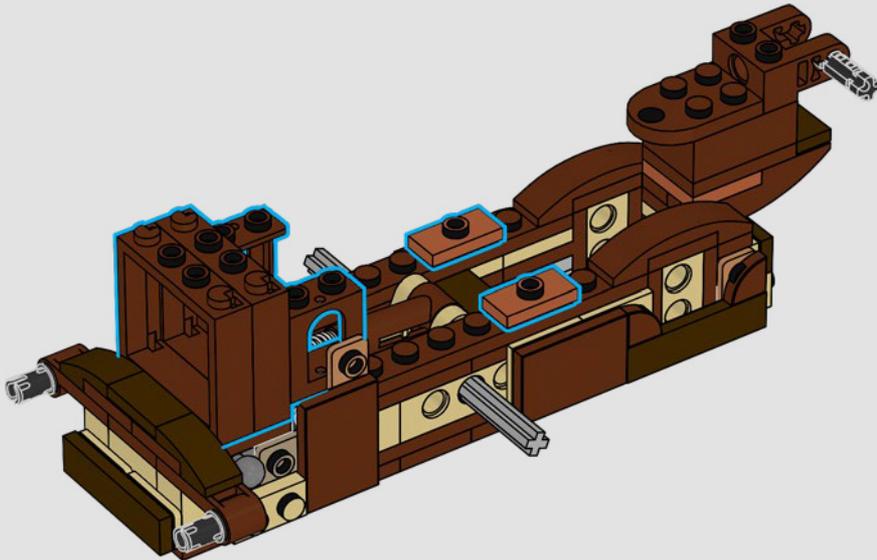


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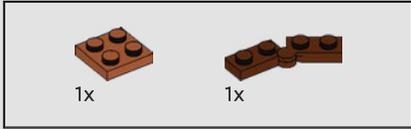
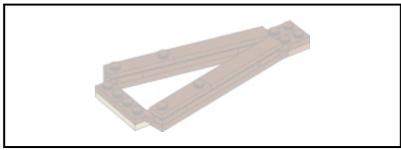




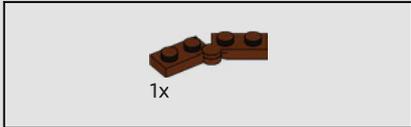
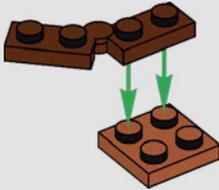
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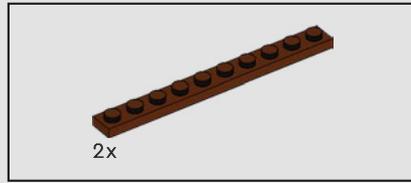




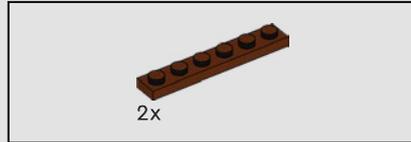
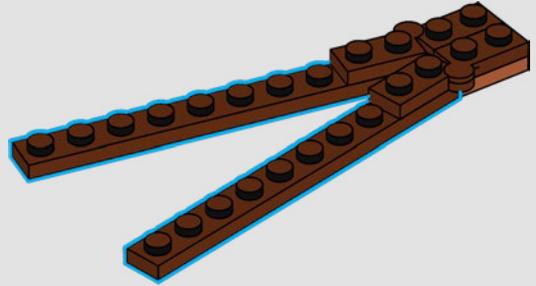
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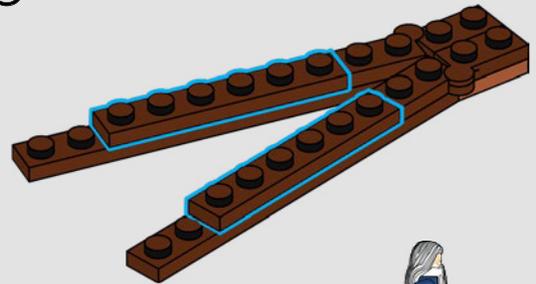
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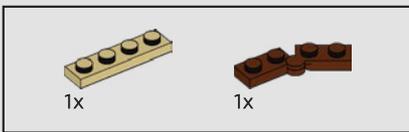


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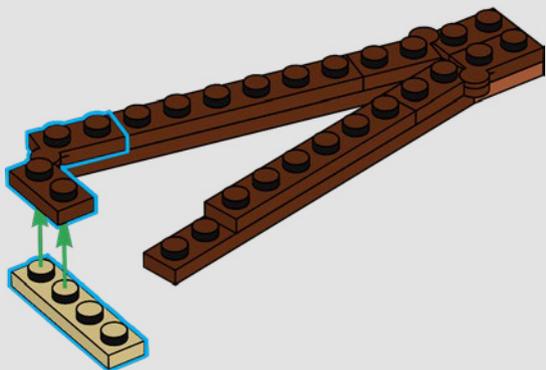


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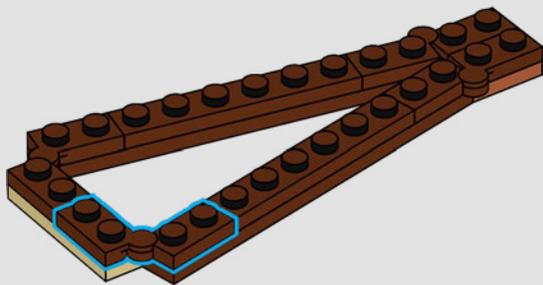




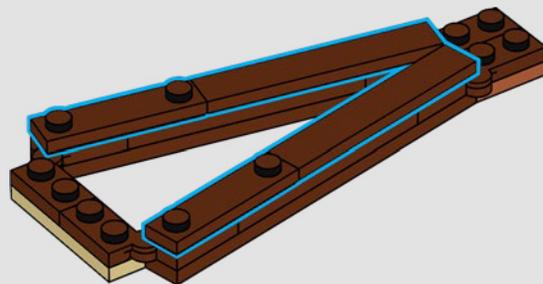
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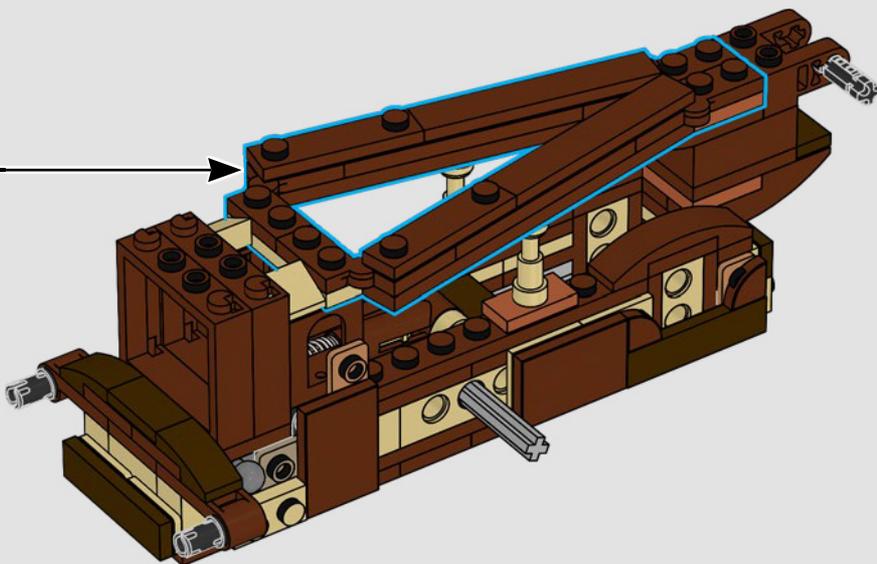
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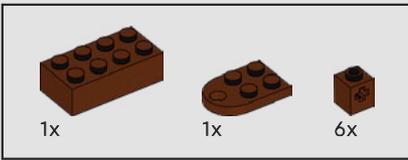


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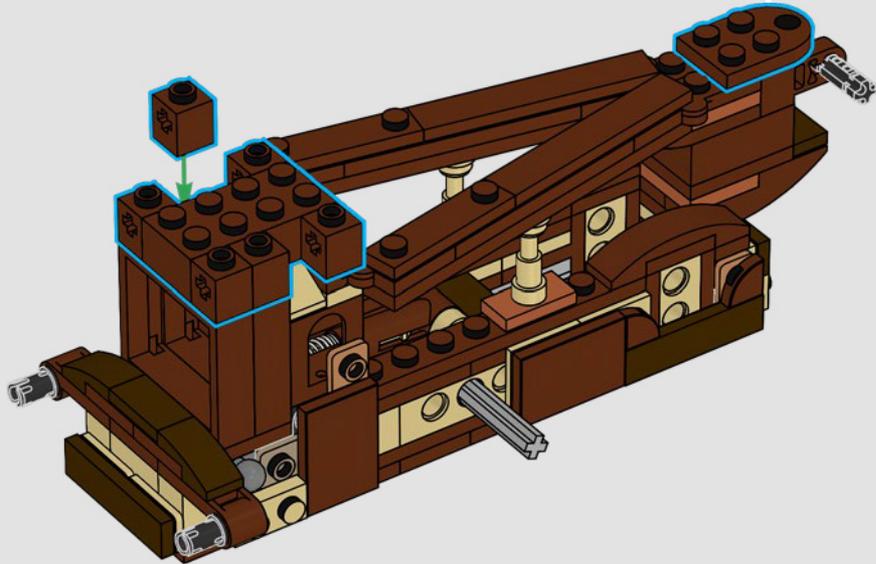
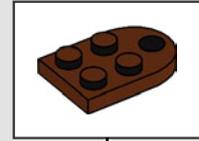


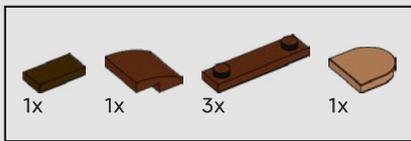
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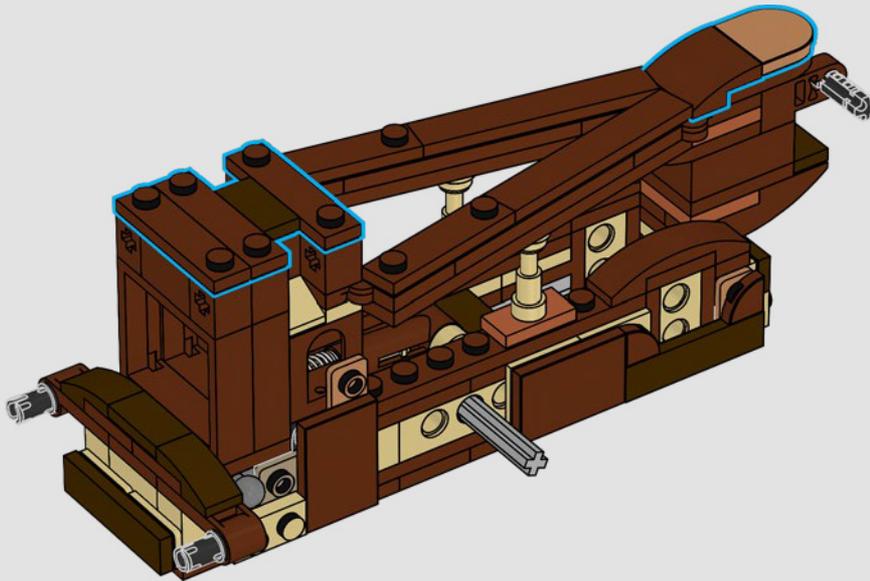


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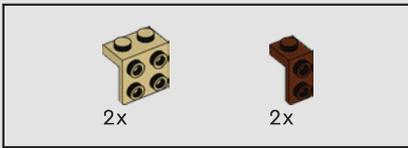


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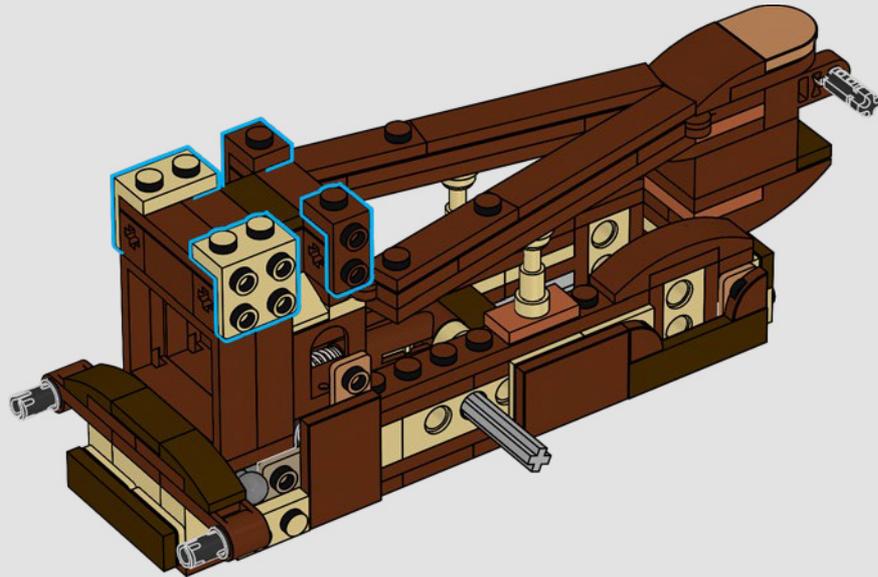


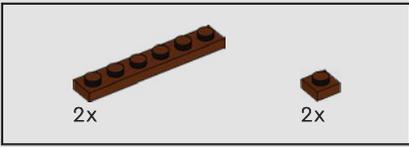


Leonardo da Vinci hielt davon unbeirrt an seiner Idee fest, dass der menschliche Körper genügend Energie erzeugen könnte, um einen Flugapparat anzutreiben.

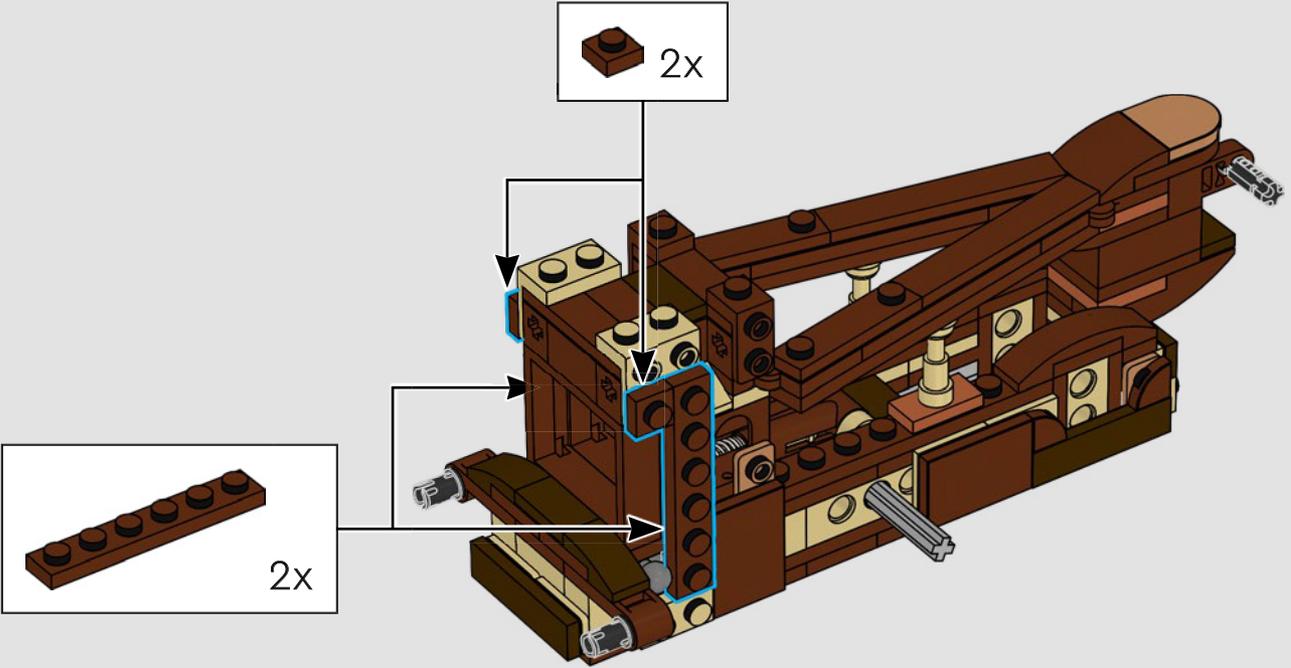


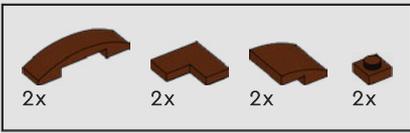
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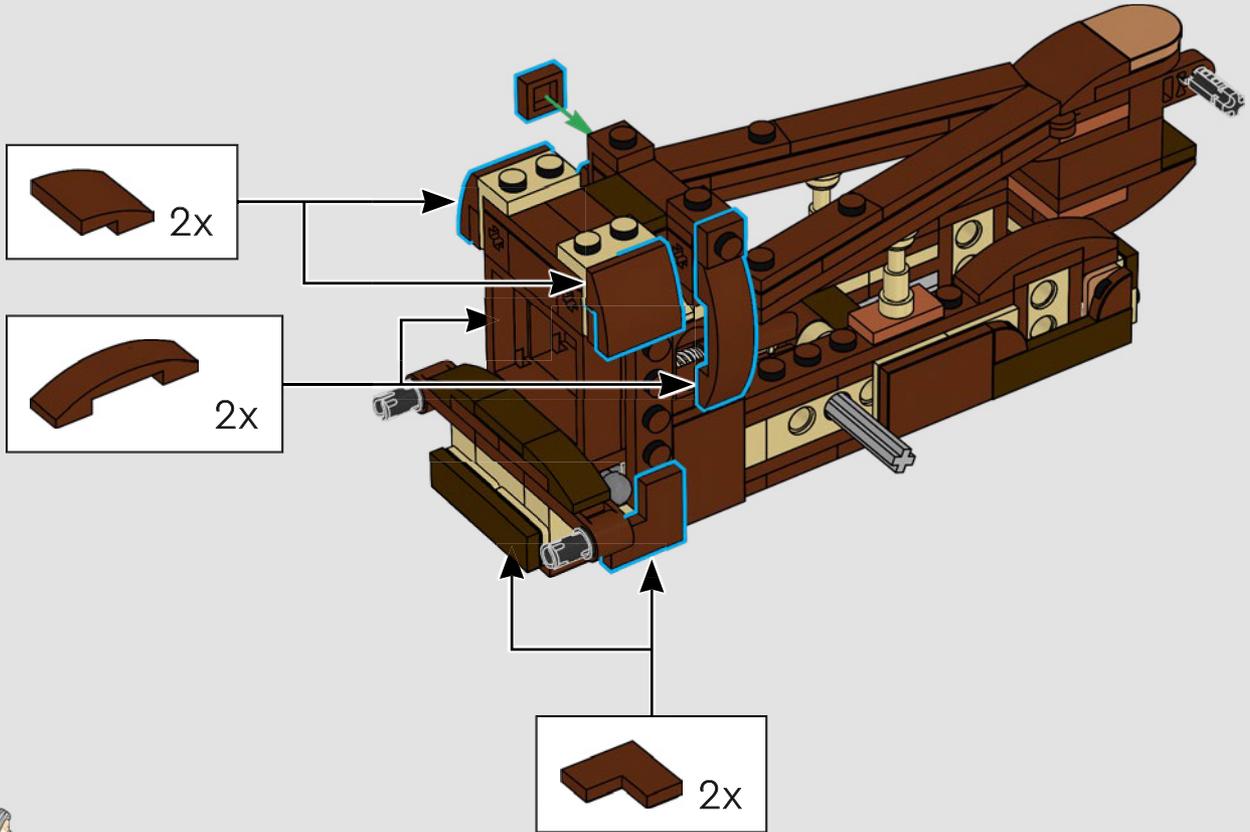


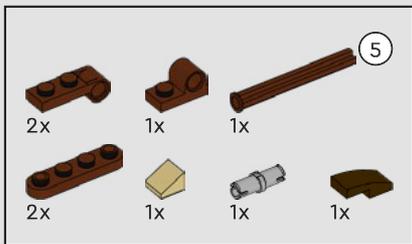
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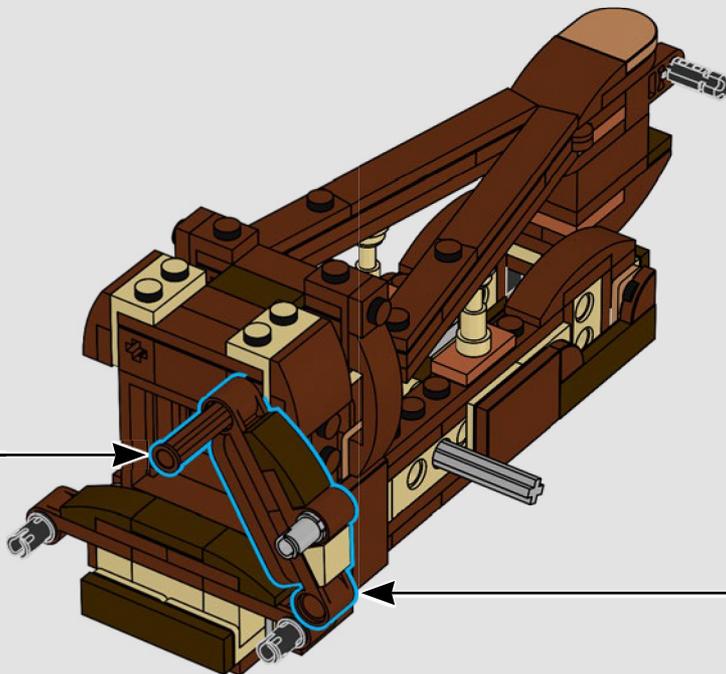
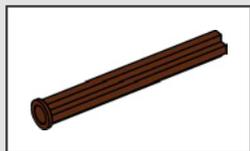
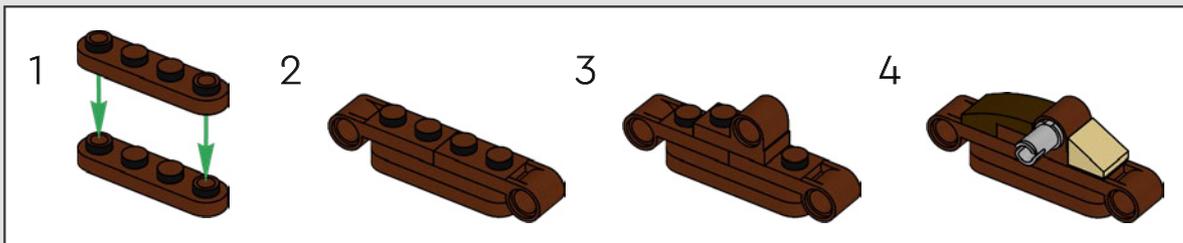


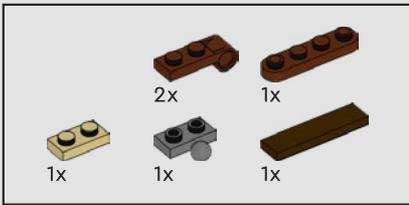
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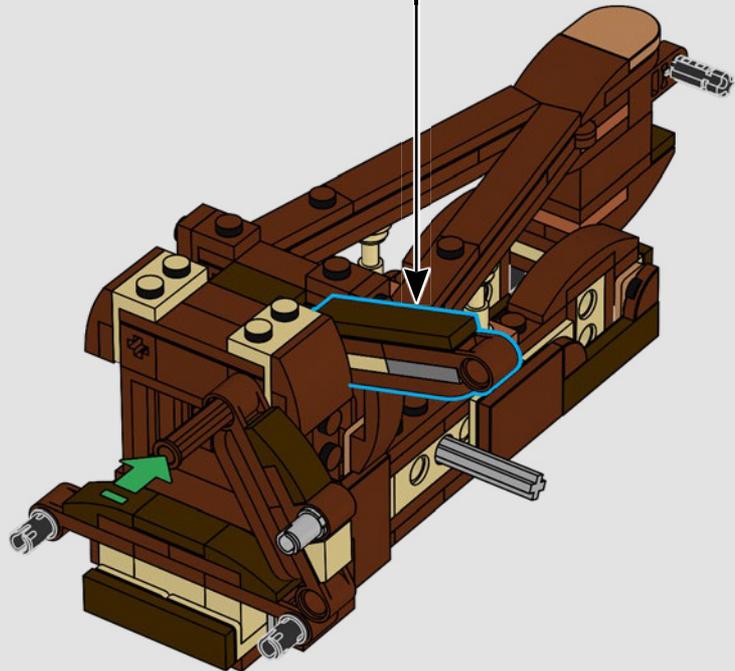
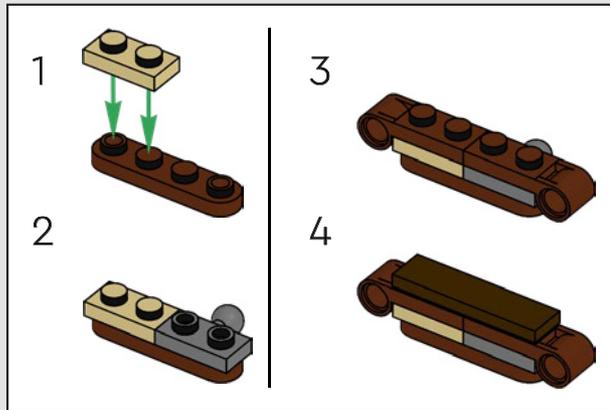


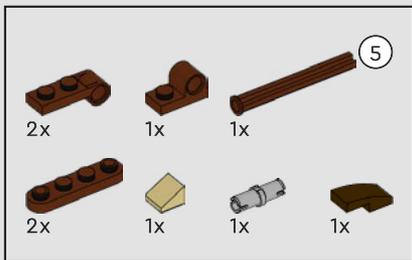
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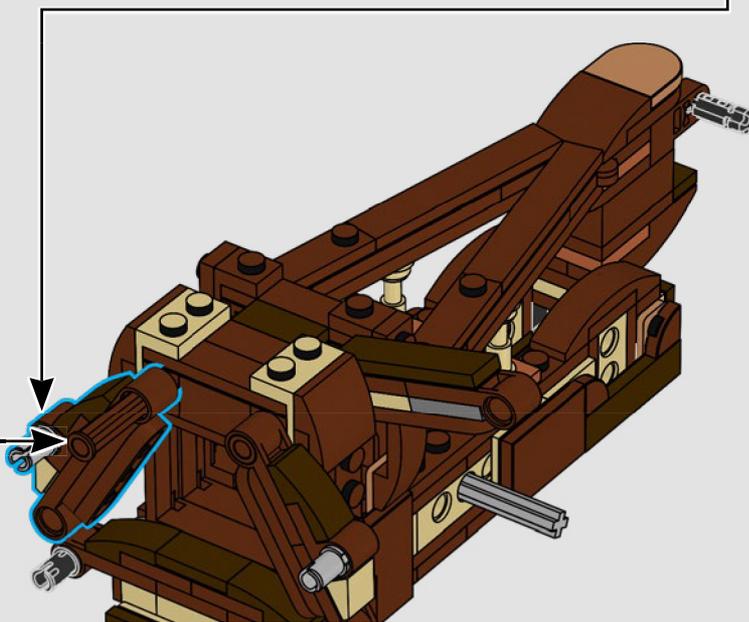
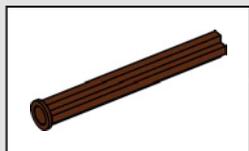
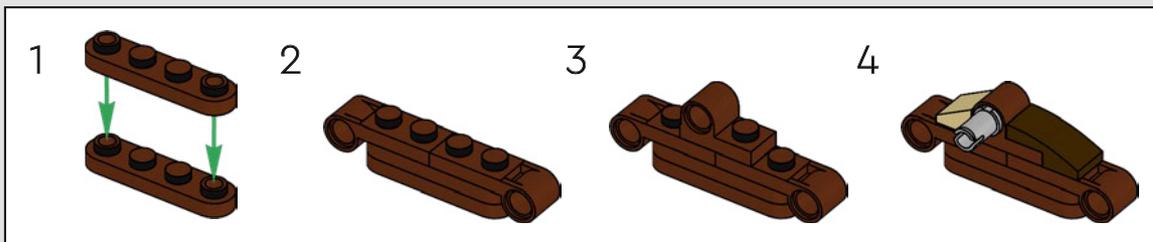


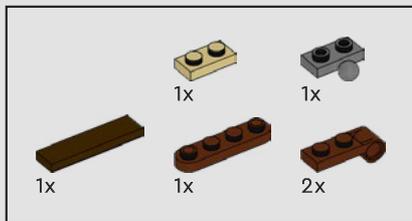
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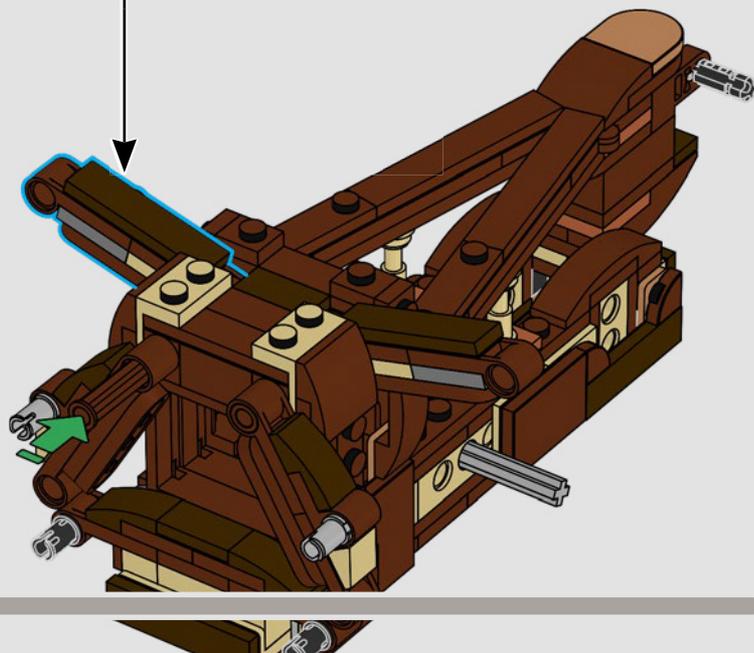
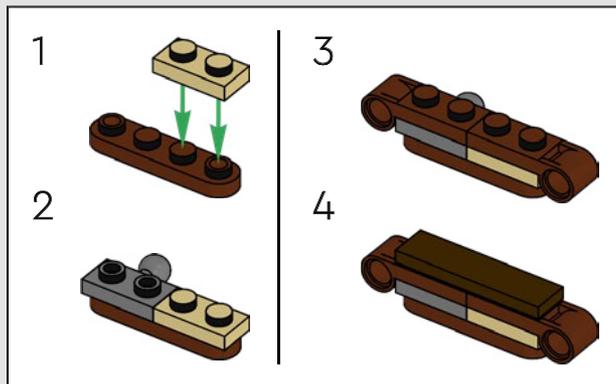


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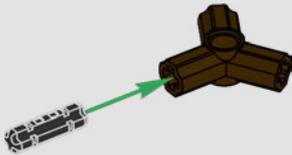


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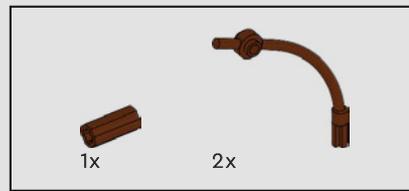




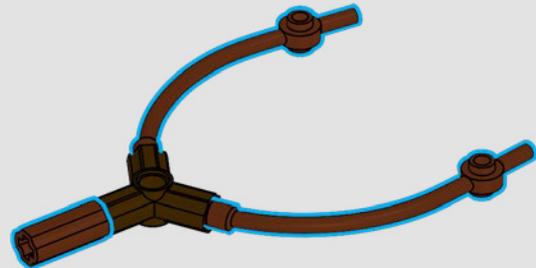
97



Leonardo da Vincis Skizzen zeigen unterschiedliche Fluggeräte, die vom Piloten mit unterschiedlicher Antriebsmechanik gesteuert werden. Manche davon werden mit den Beinen angetrieben, andere mit Armen und Beinen und wieder andere hatten Ruder, die mit dem Kopf des Piloten verbunden waren.

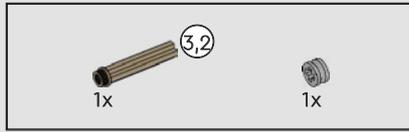


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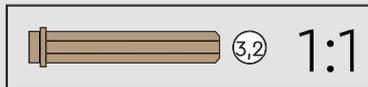
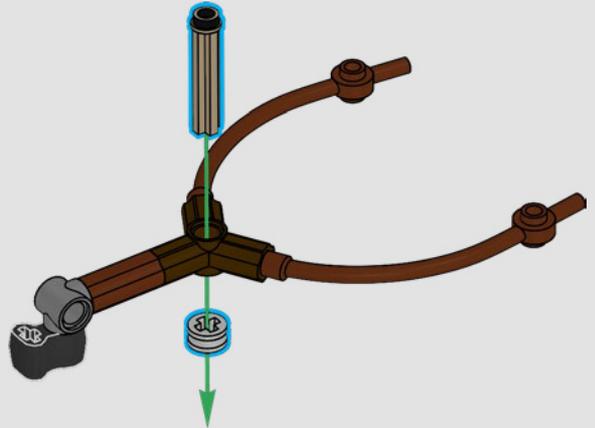




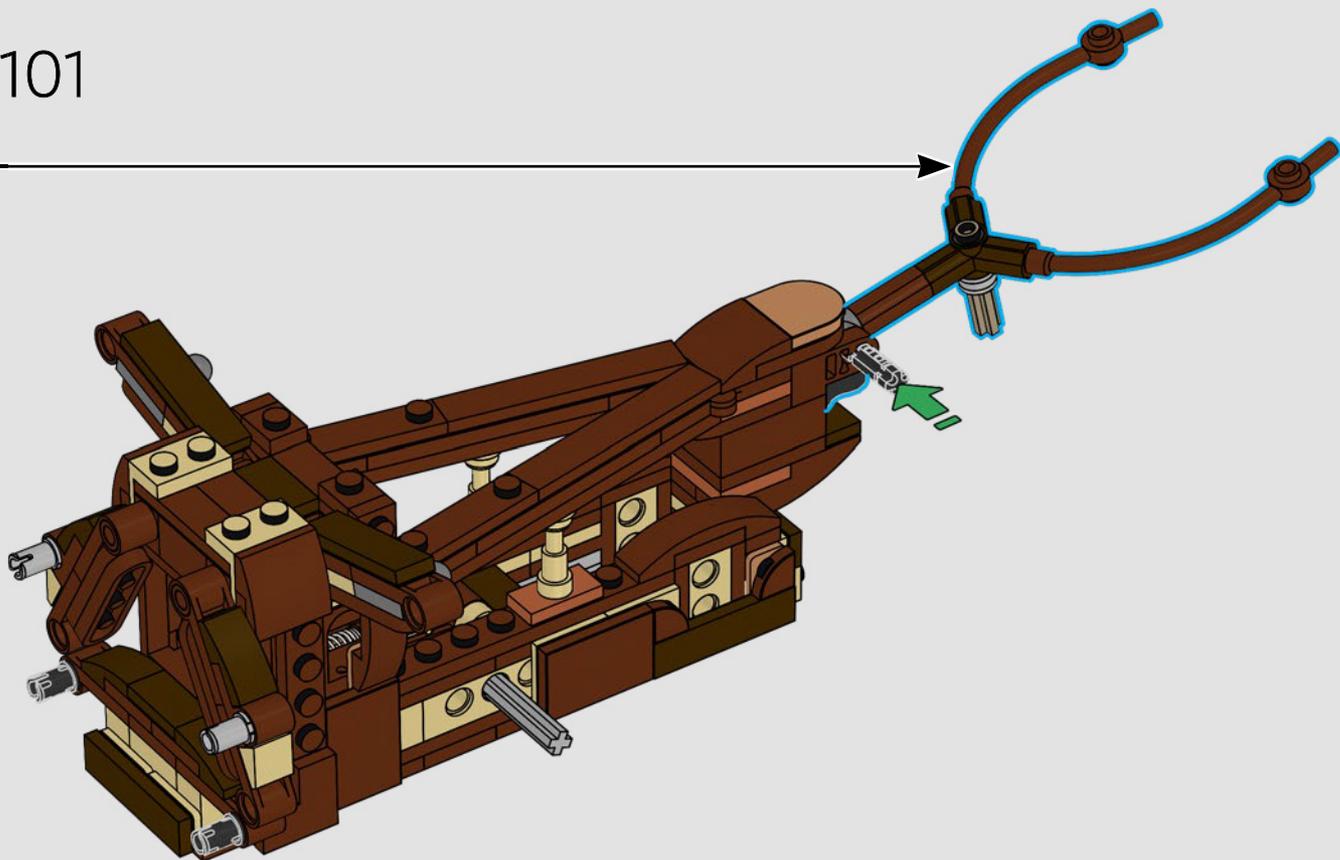
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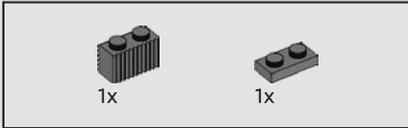
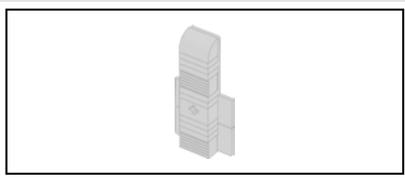


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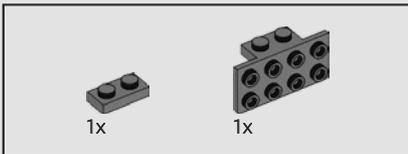
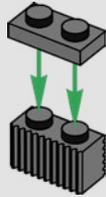


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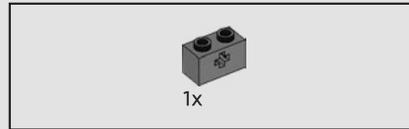
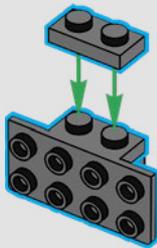




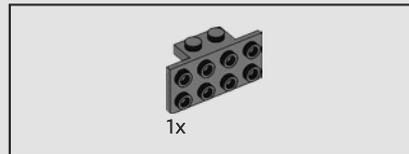
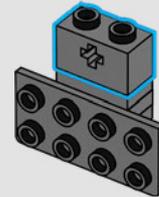
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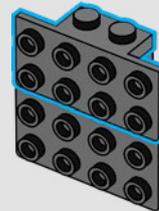
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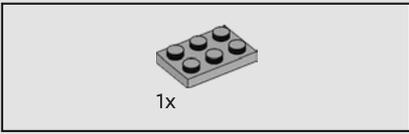


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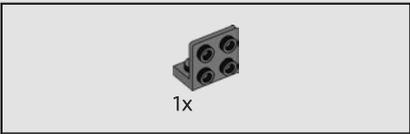
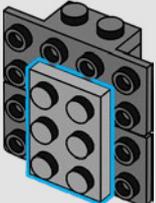


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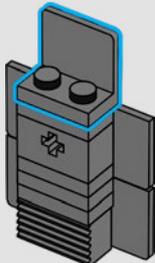


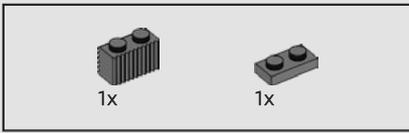


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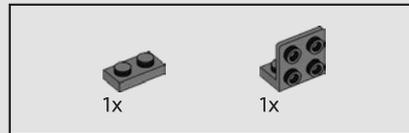
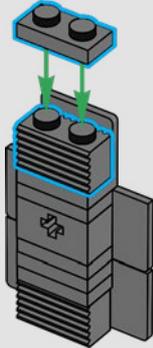


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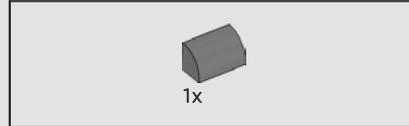
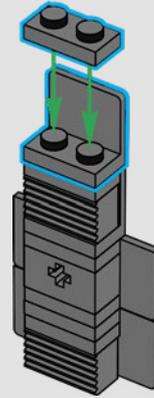




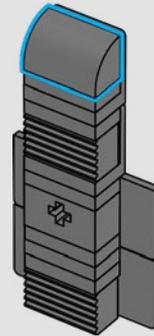
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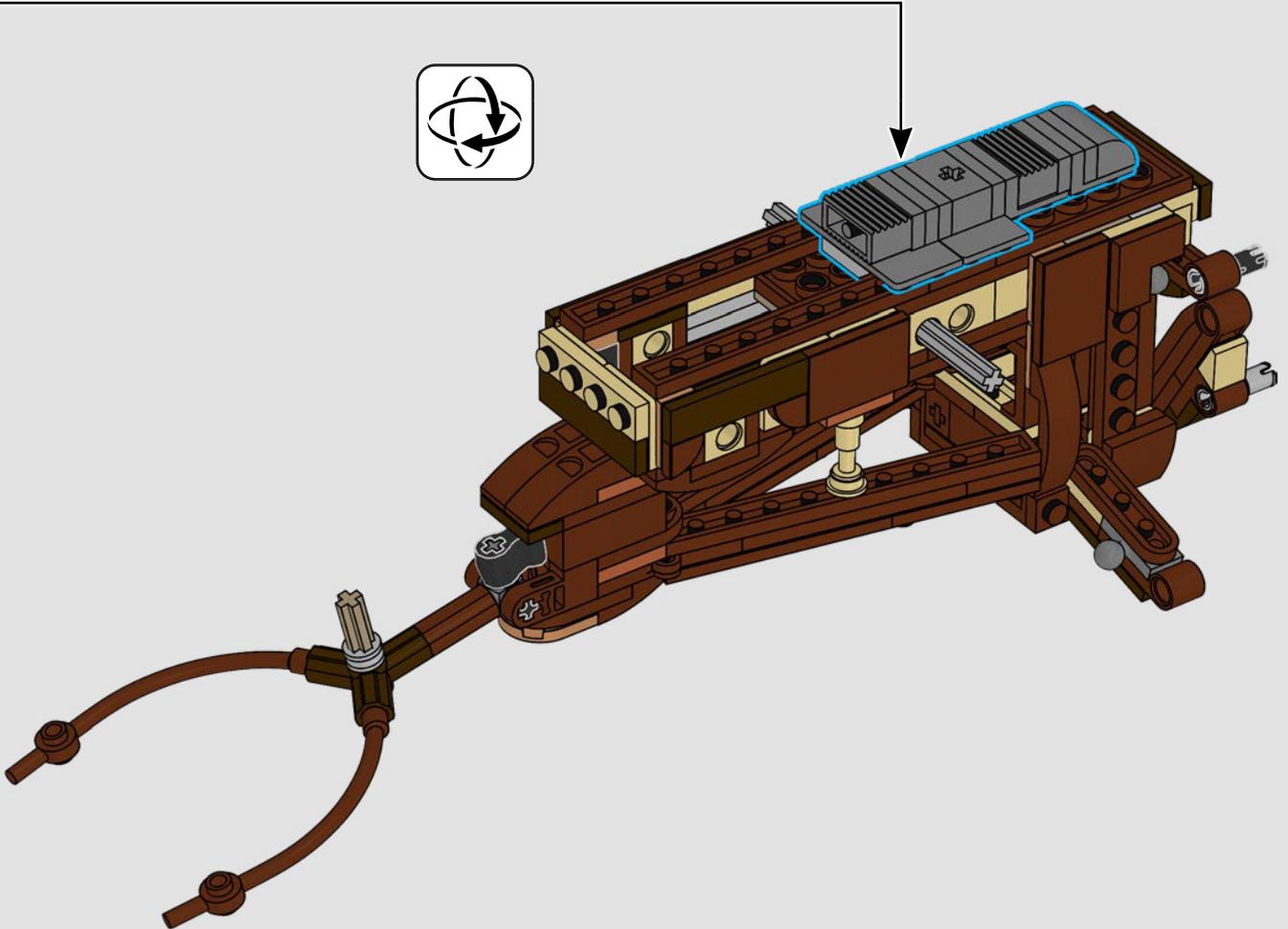


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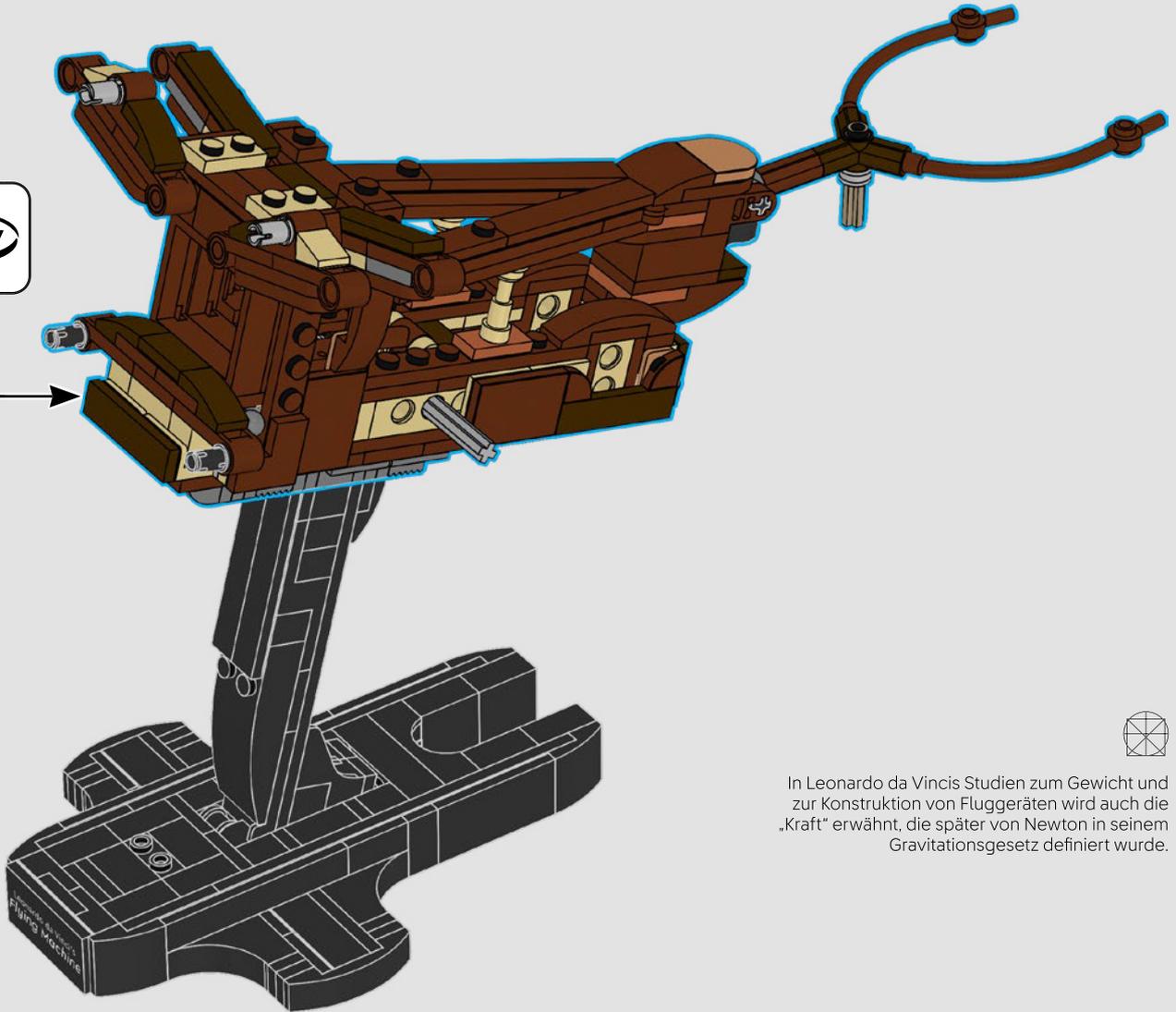


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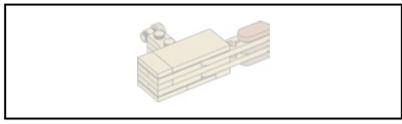


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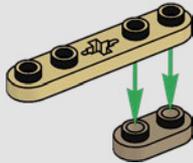


In Leonardo da Vincis Studien zum Gewicht und zur Konstruktion von Fluggeräten wird auch die „Kraft“ erwähnt, die später von Newton in seinem Gravitationsgesetz definiert wurde.





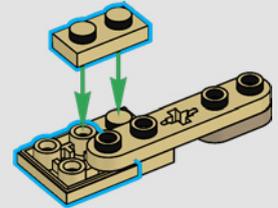
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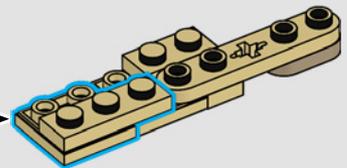
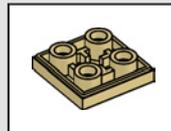
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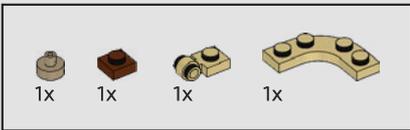


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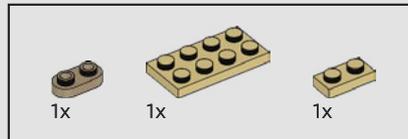
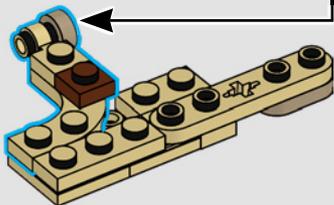
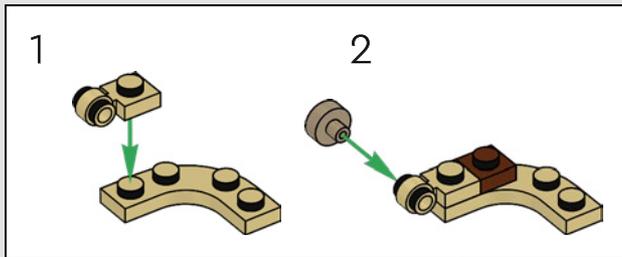


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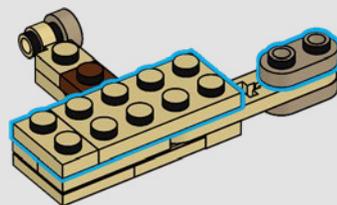


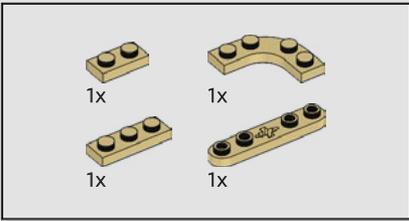


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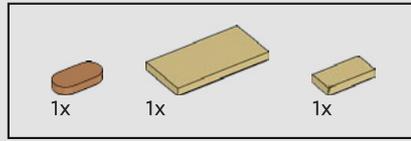
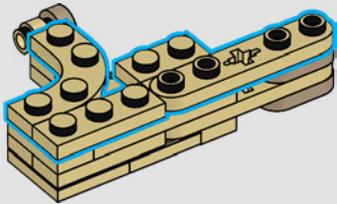


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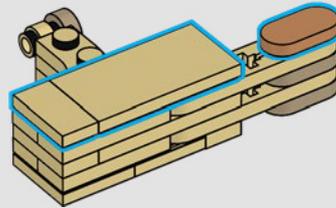


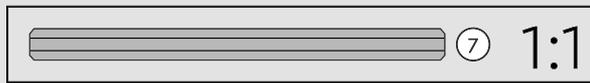
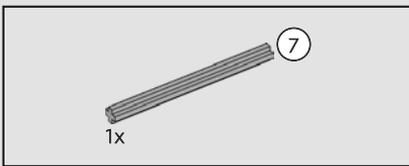


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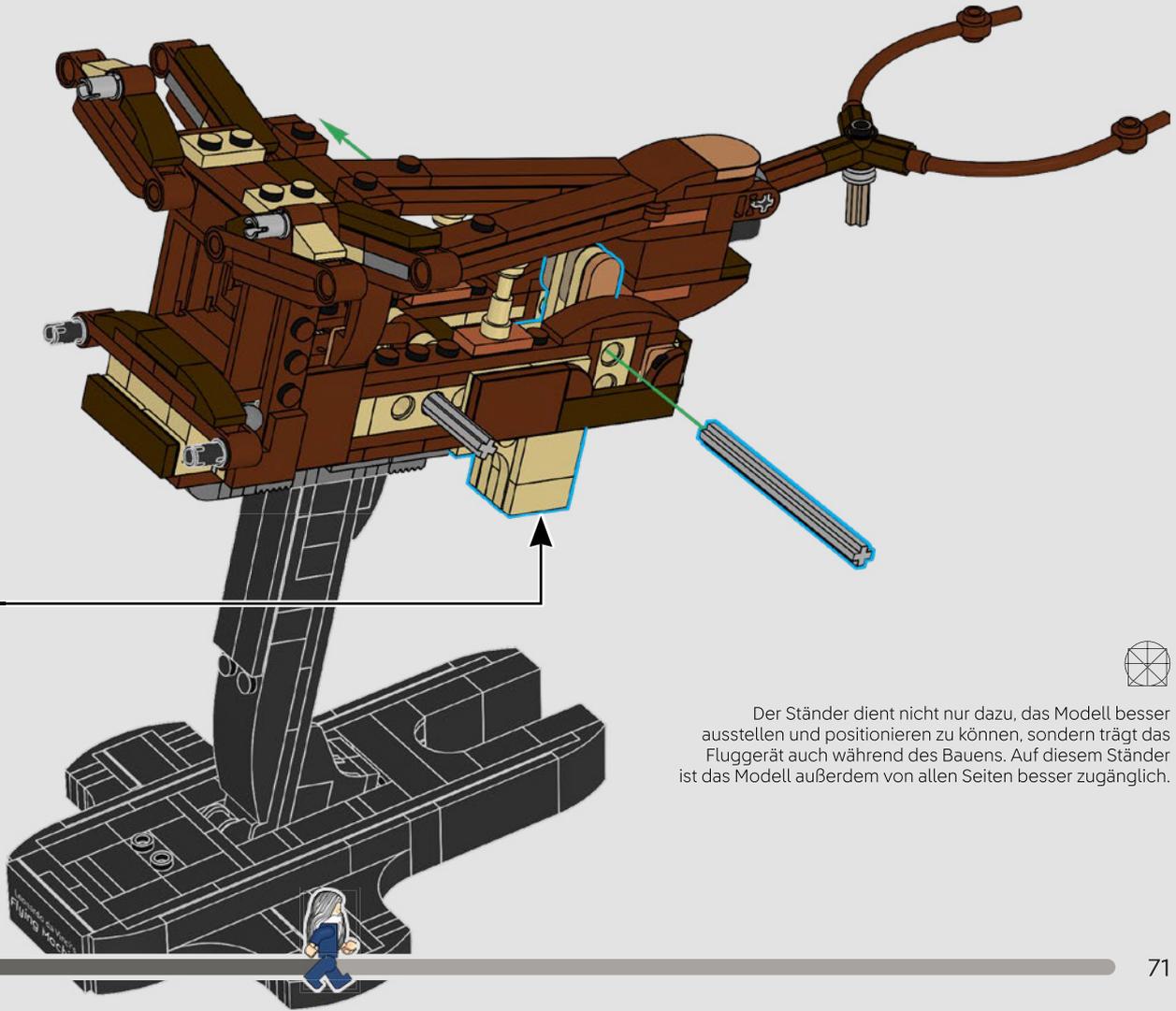


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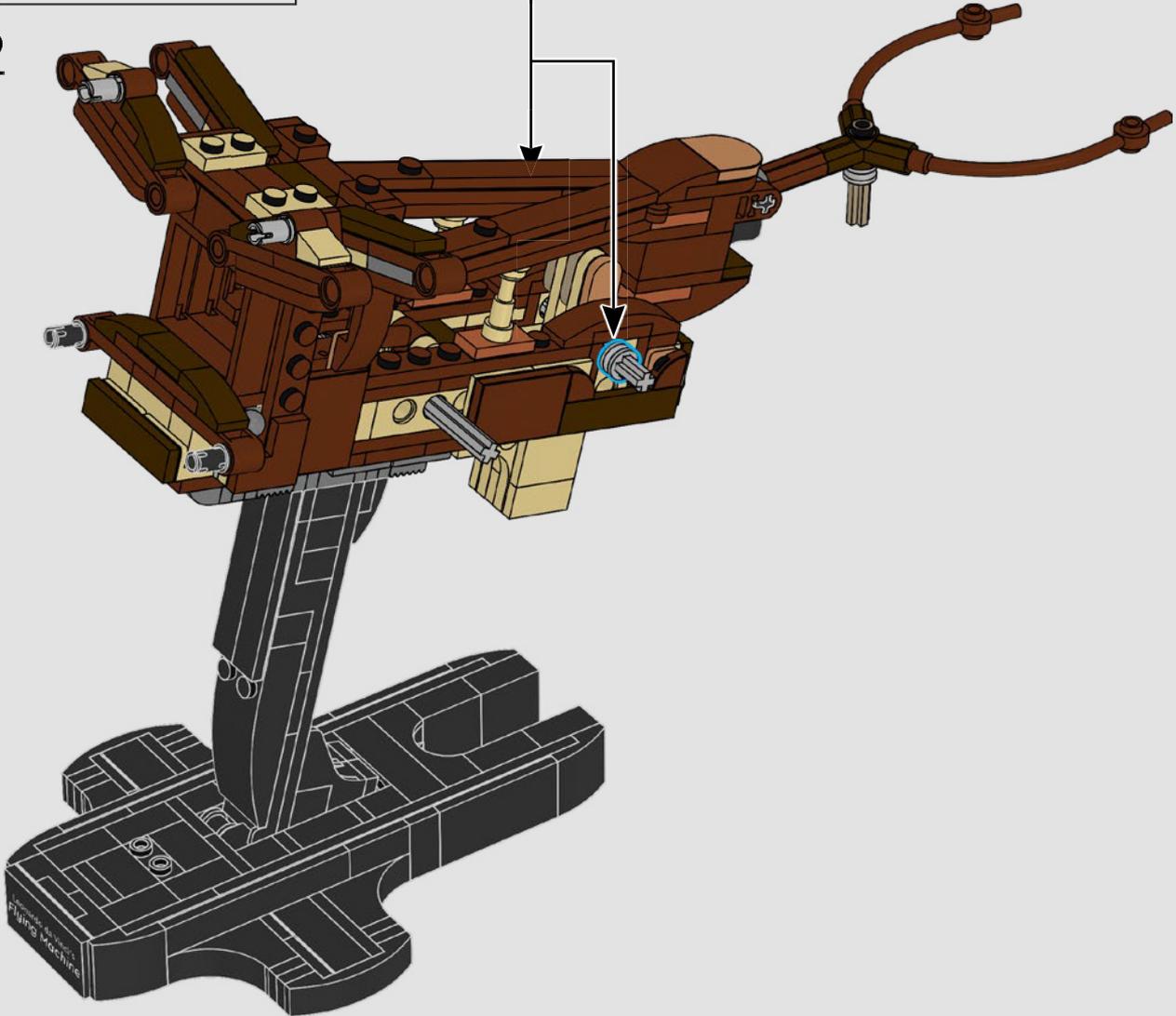
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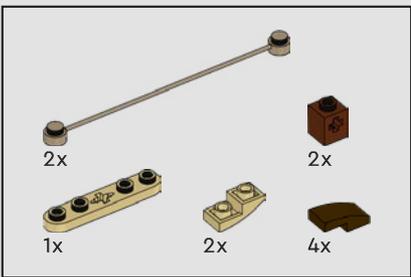


Der Ständer dient nicht nur dazu, das Modell besser ausstellen und positionieren zu können, sondern trägt das Fluggerät auch während des Bauens. Auf diesem Ständer ist das Modell außerdem von allen Seiten besser zugänglich.



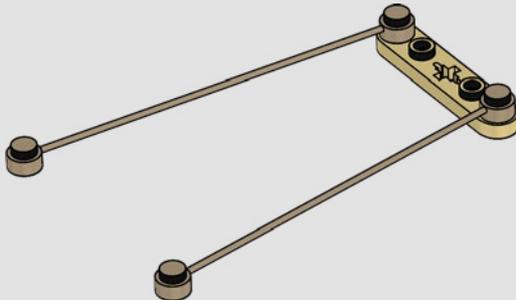
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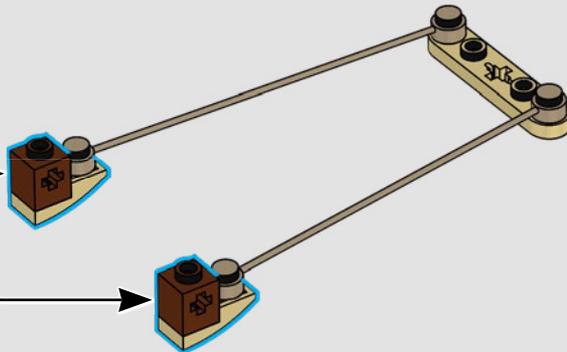
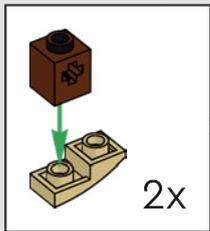


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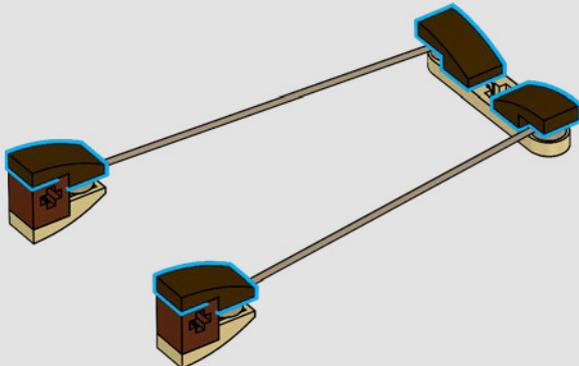
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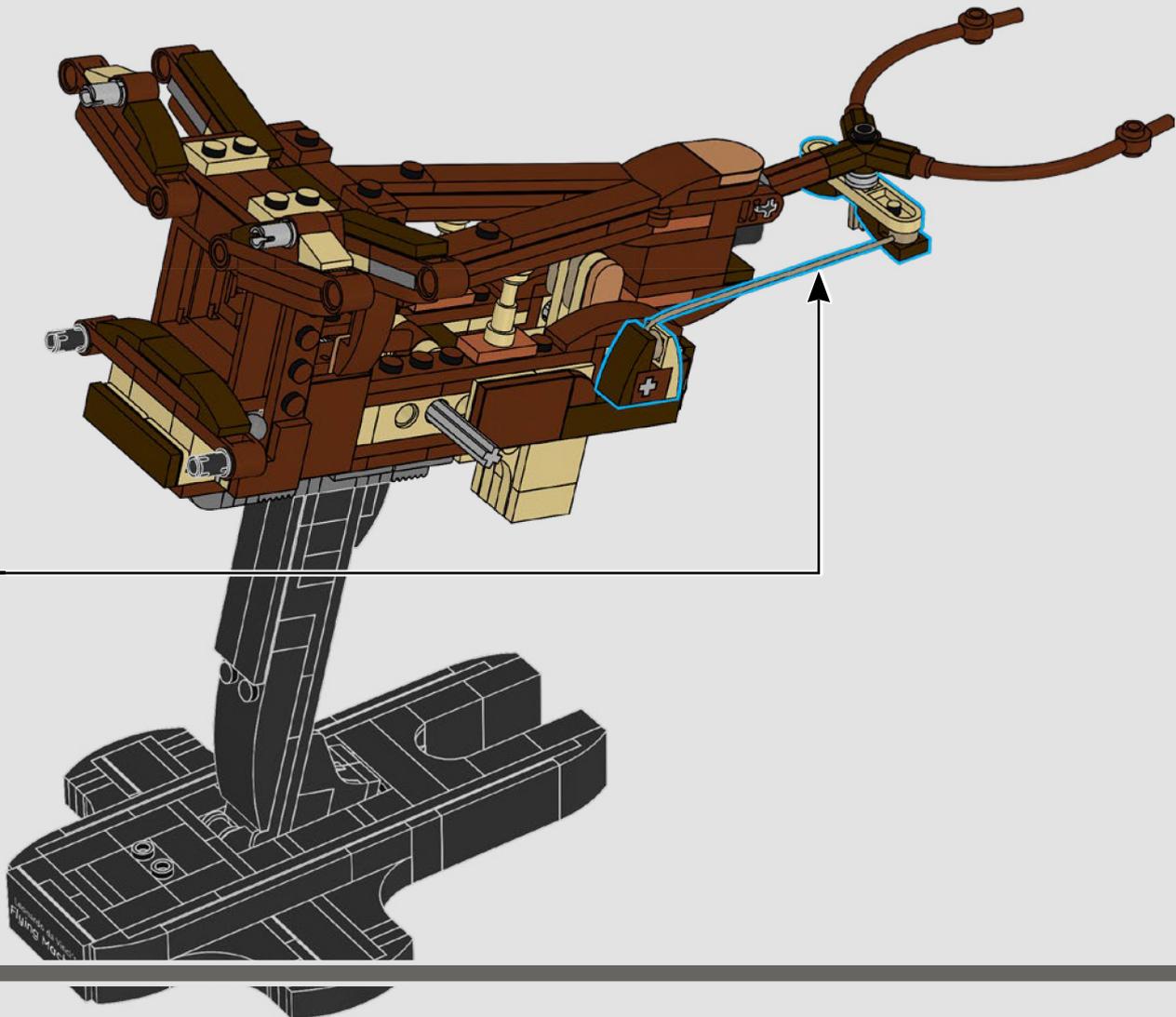


2



3

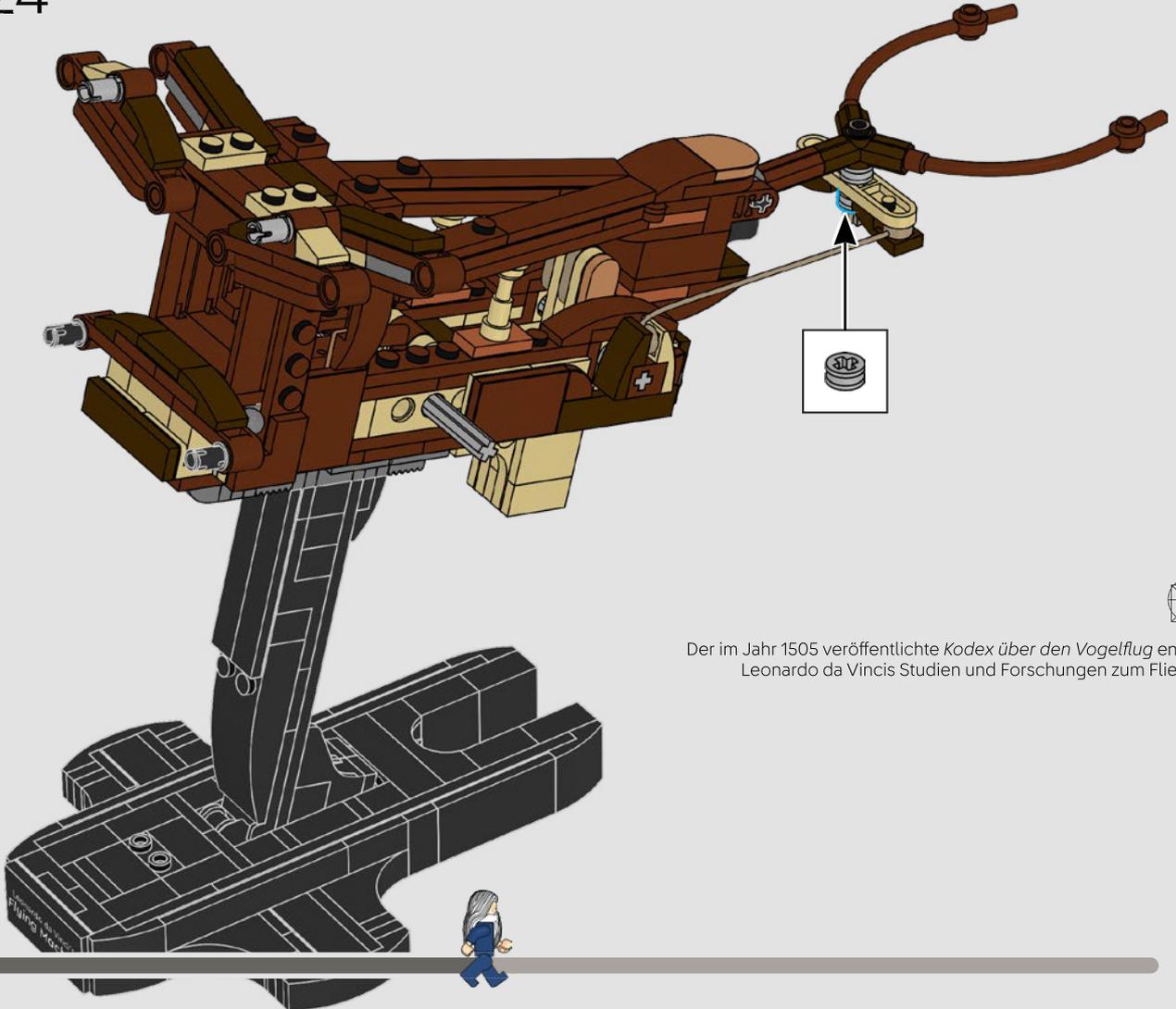




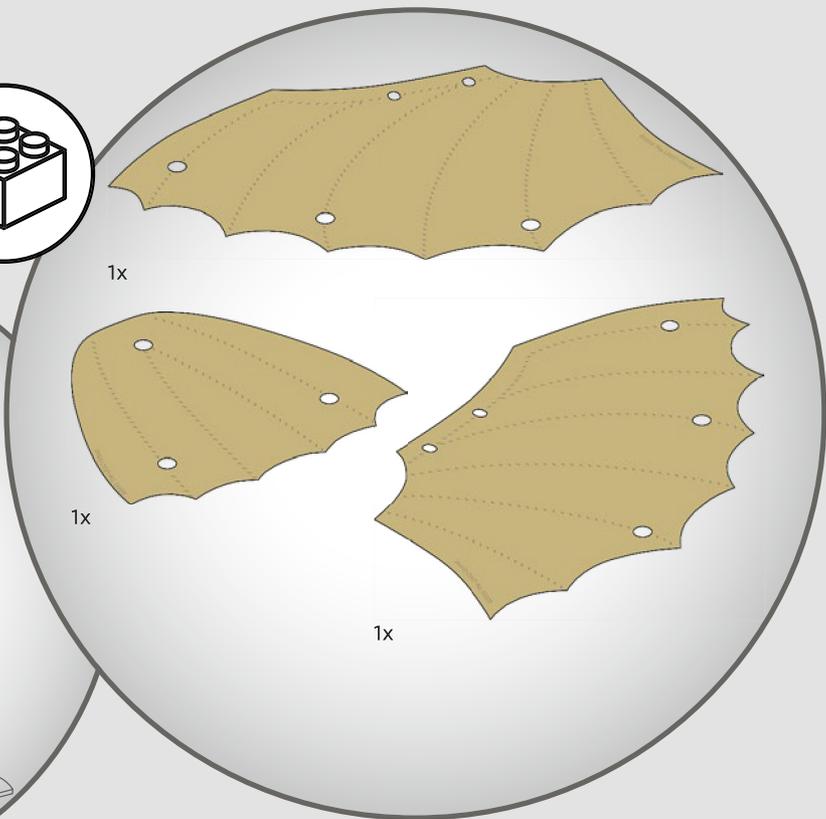
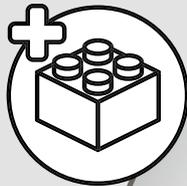
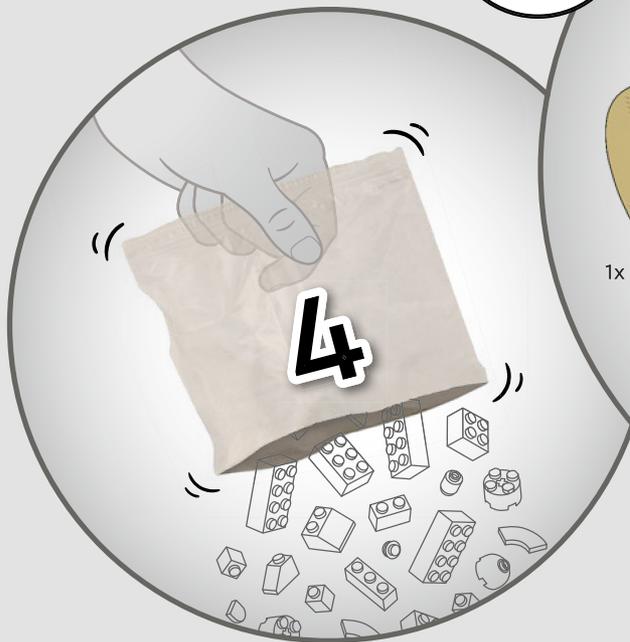


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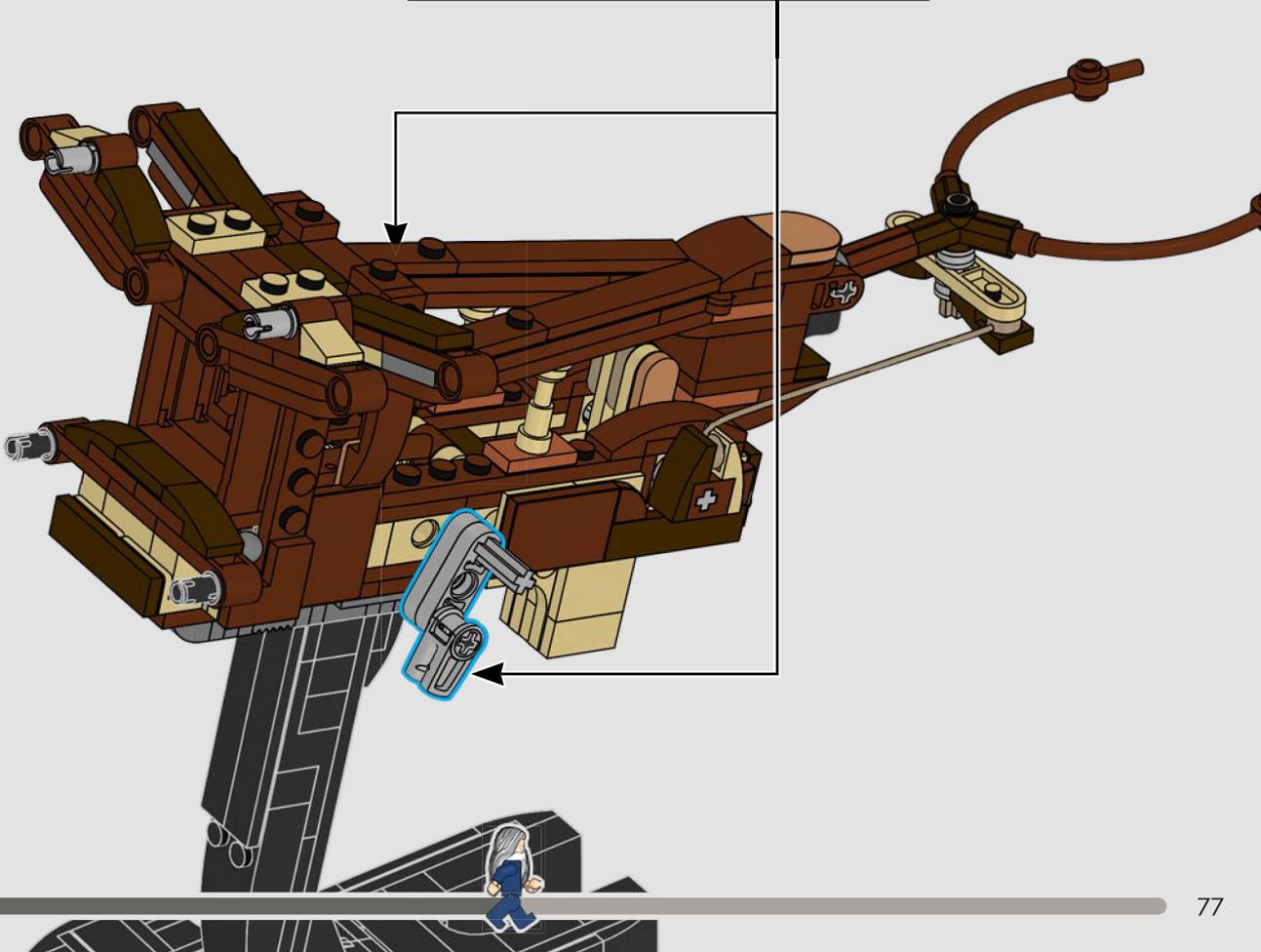
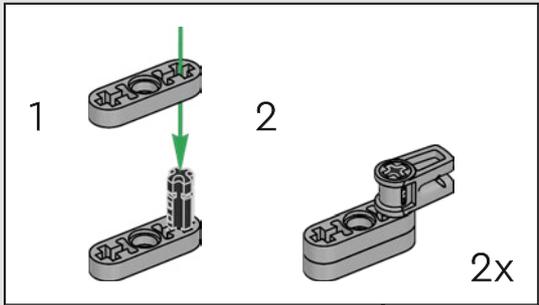


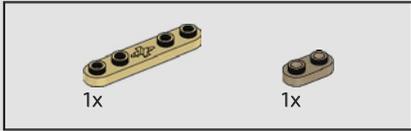
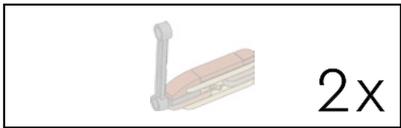
Der im Jahr 1505 veröffentlichte *Kodex über den Vogelzug* enthält Leonardo da Vincis Studien und Forschungen zum Fliegen.



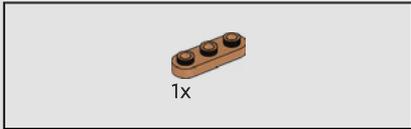
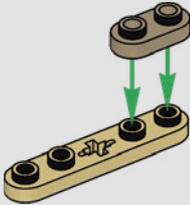


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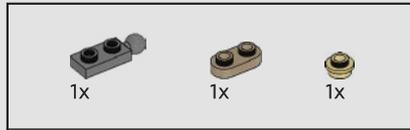
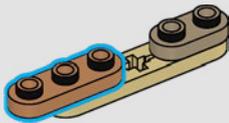




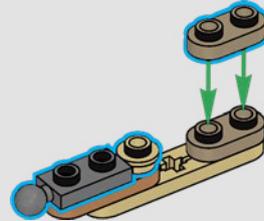
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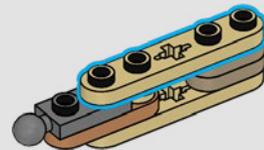
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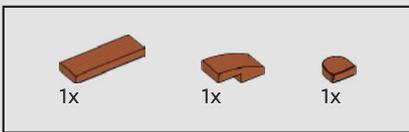


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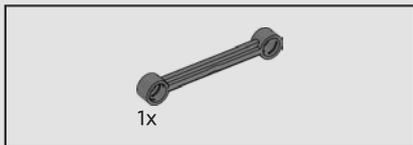
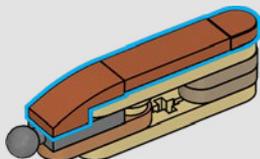


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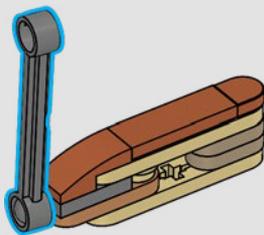




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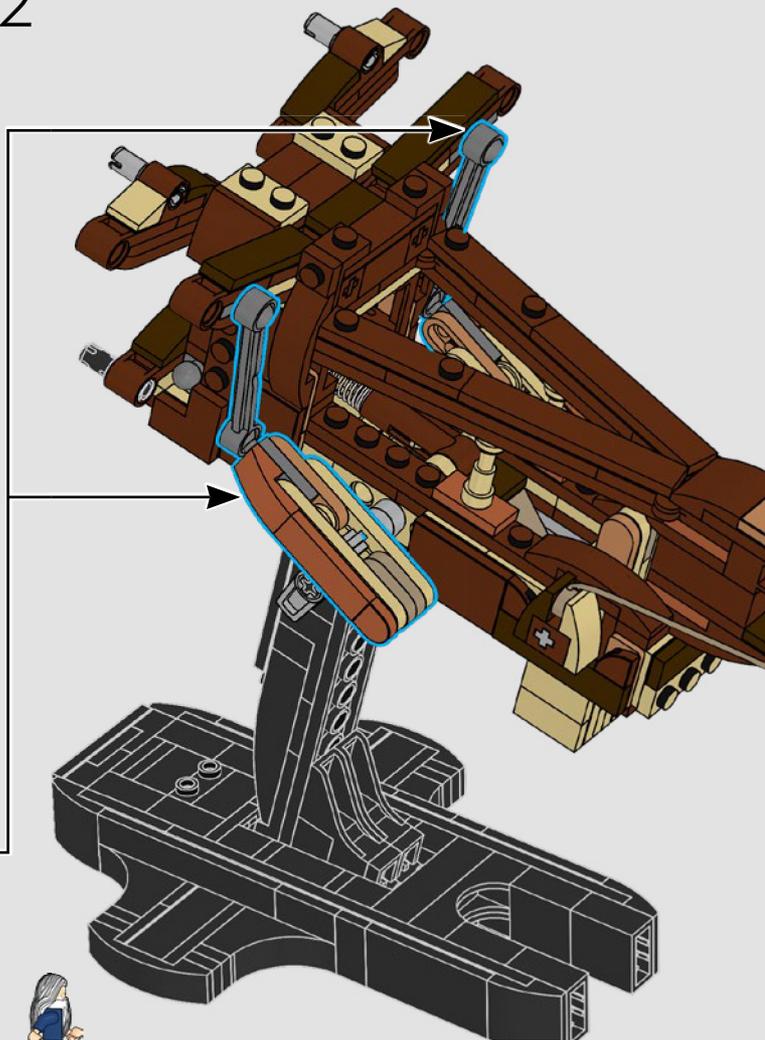


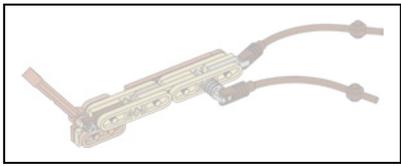
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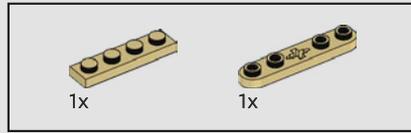
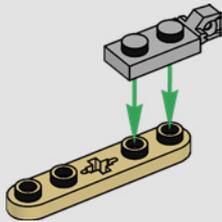
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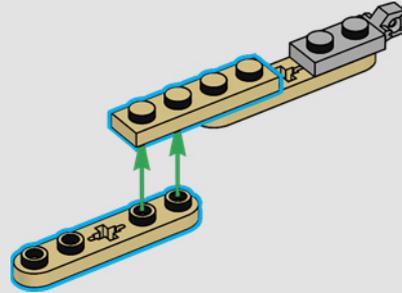




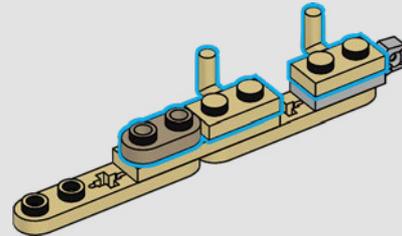
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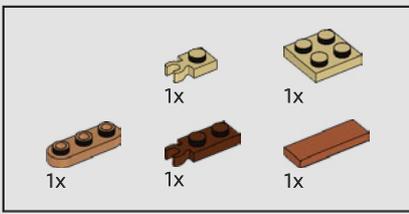


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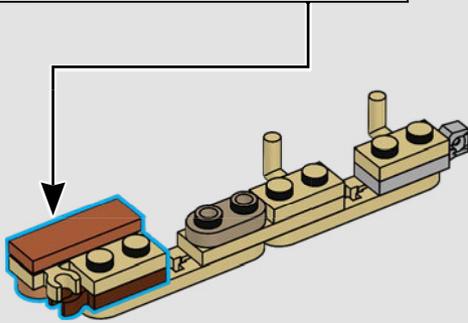
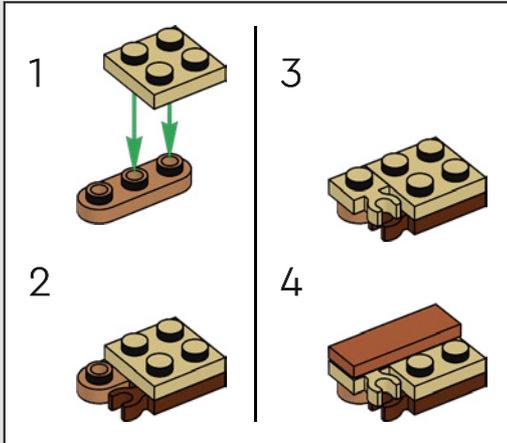


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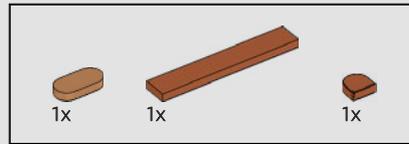
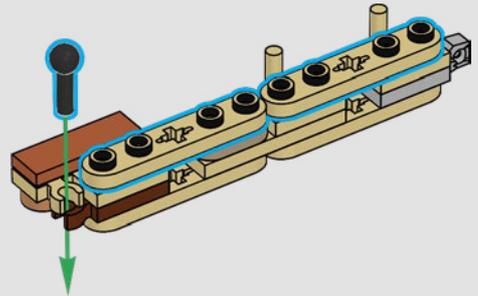




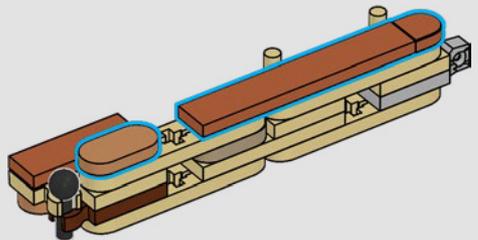
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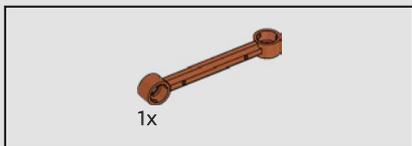


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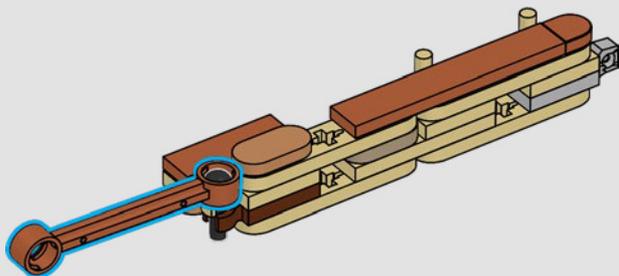


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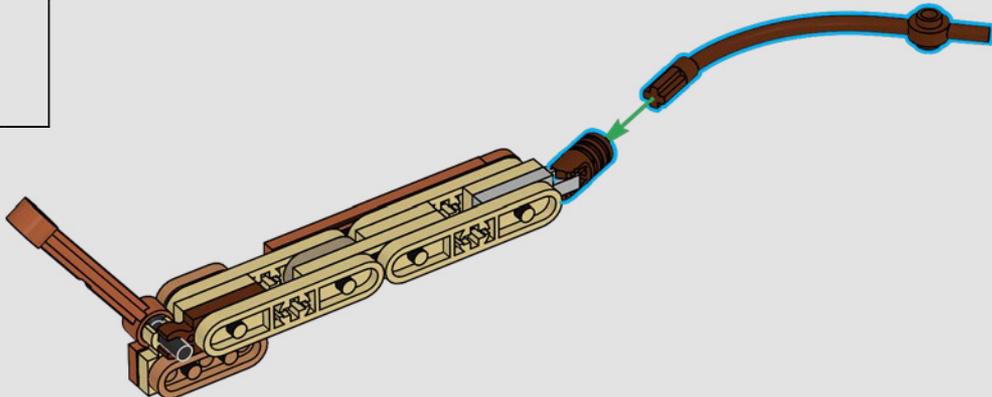
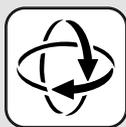


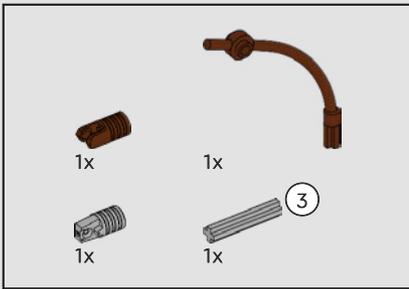


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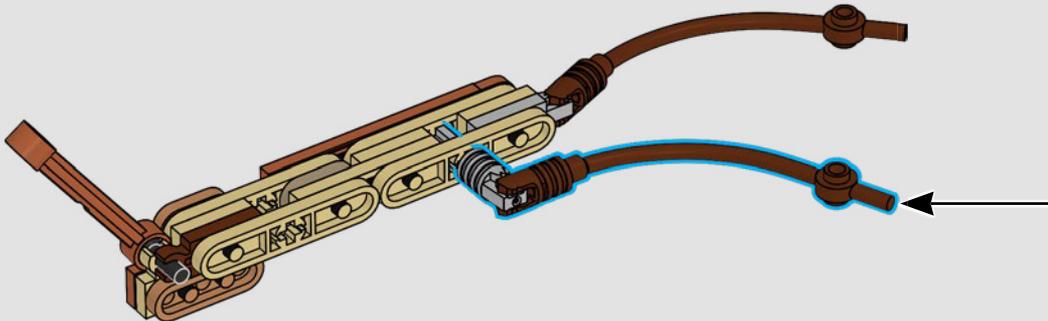
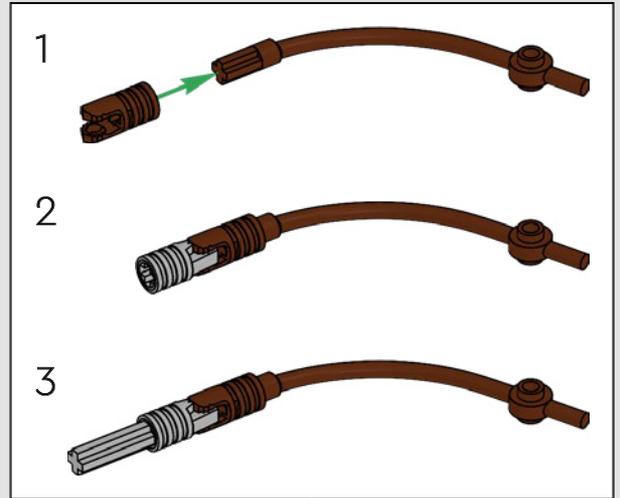


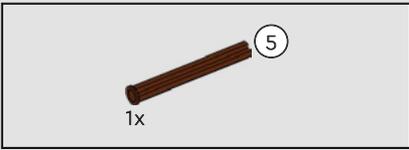
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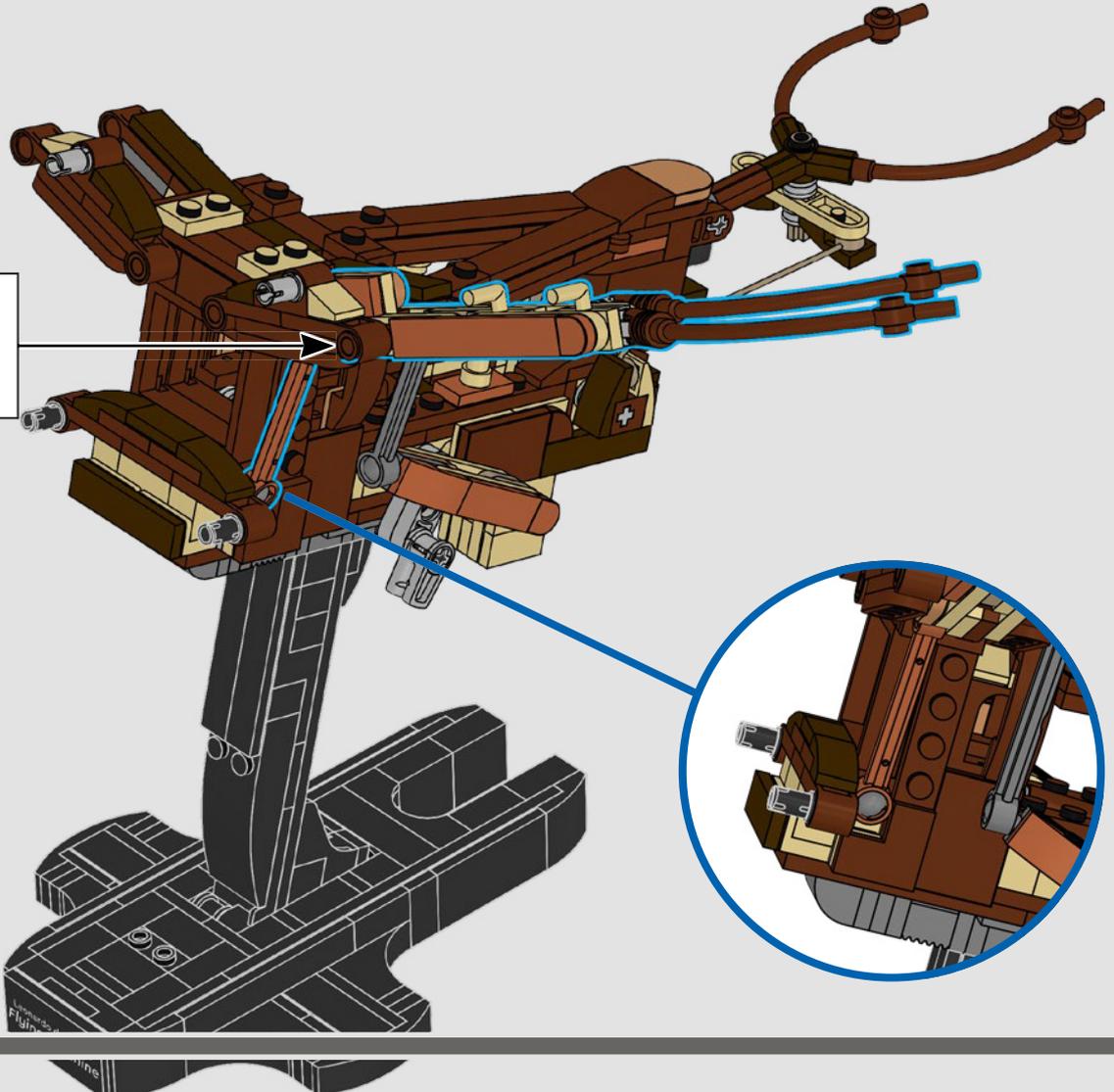
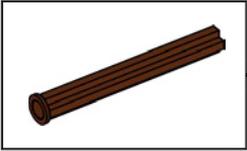


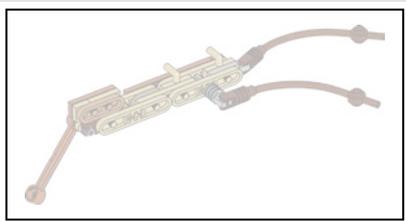
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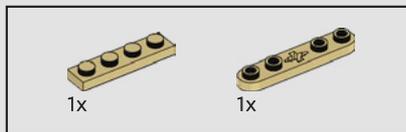
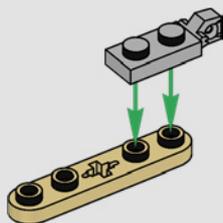


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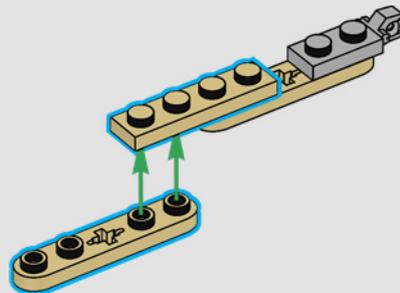




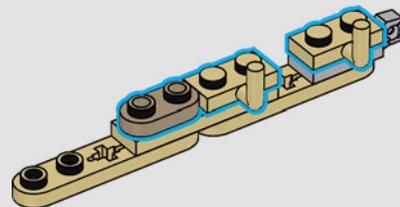
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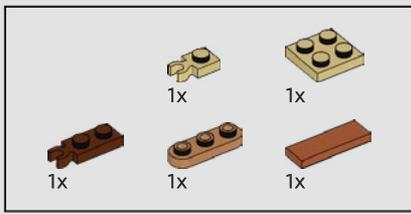


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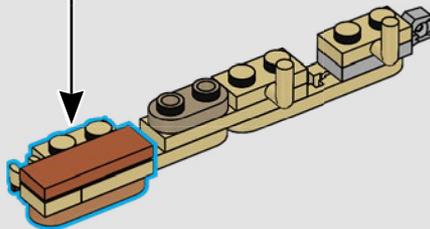
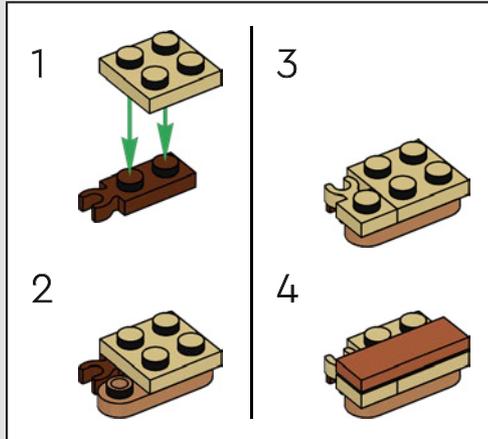


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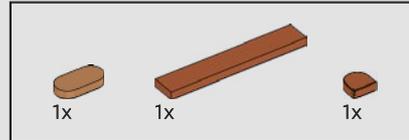
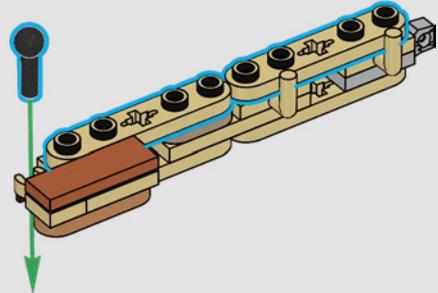




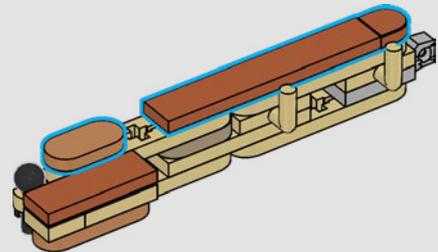
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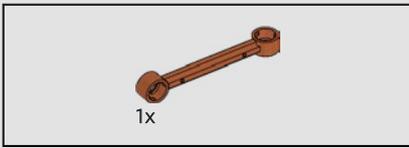


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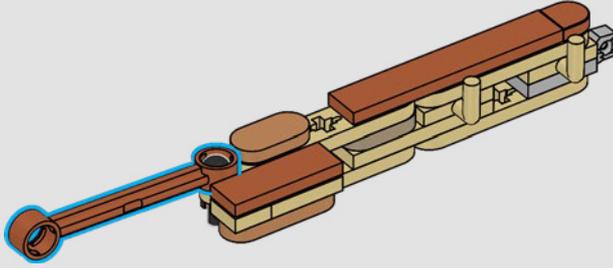


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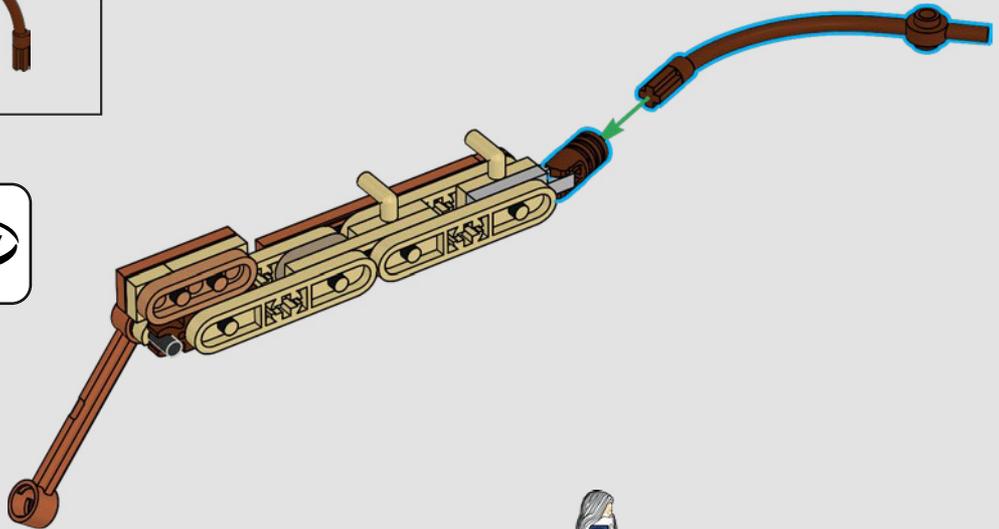


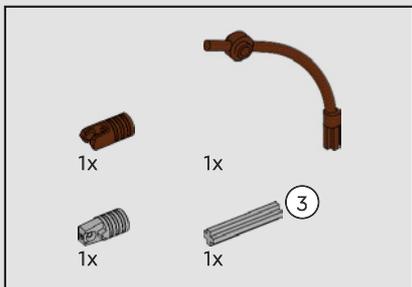


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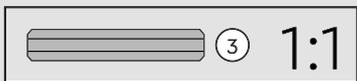
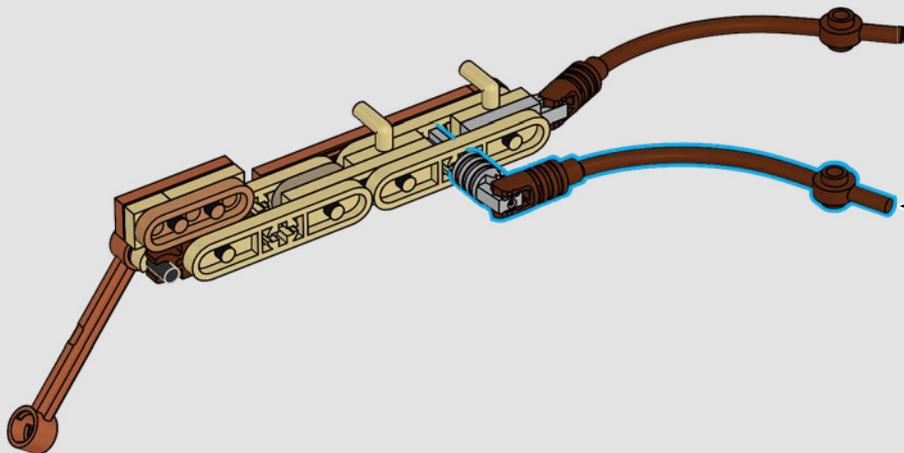
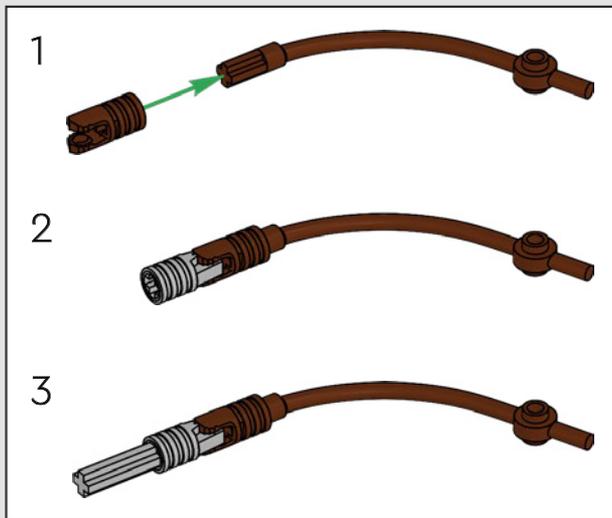


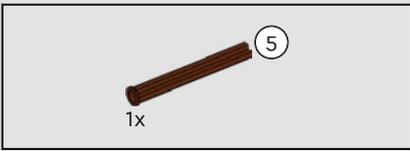
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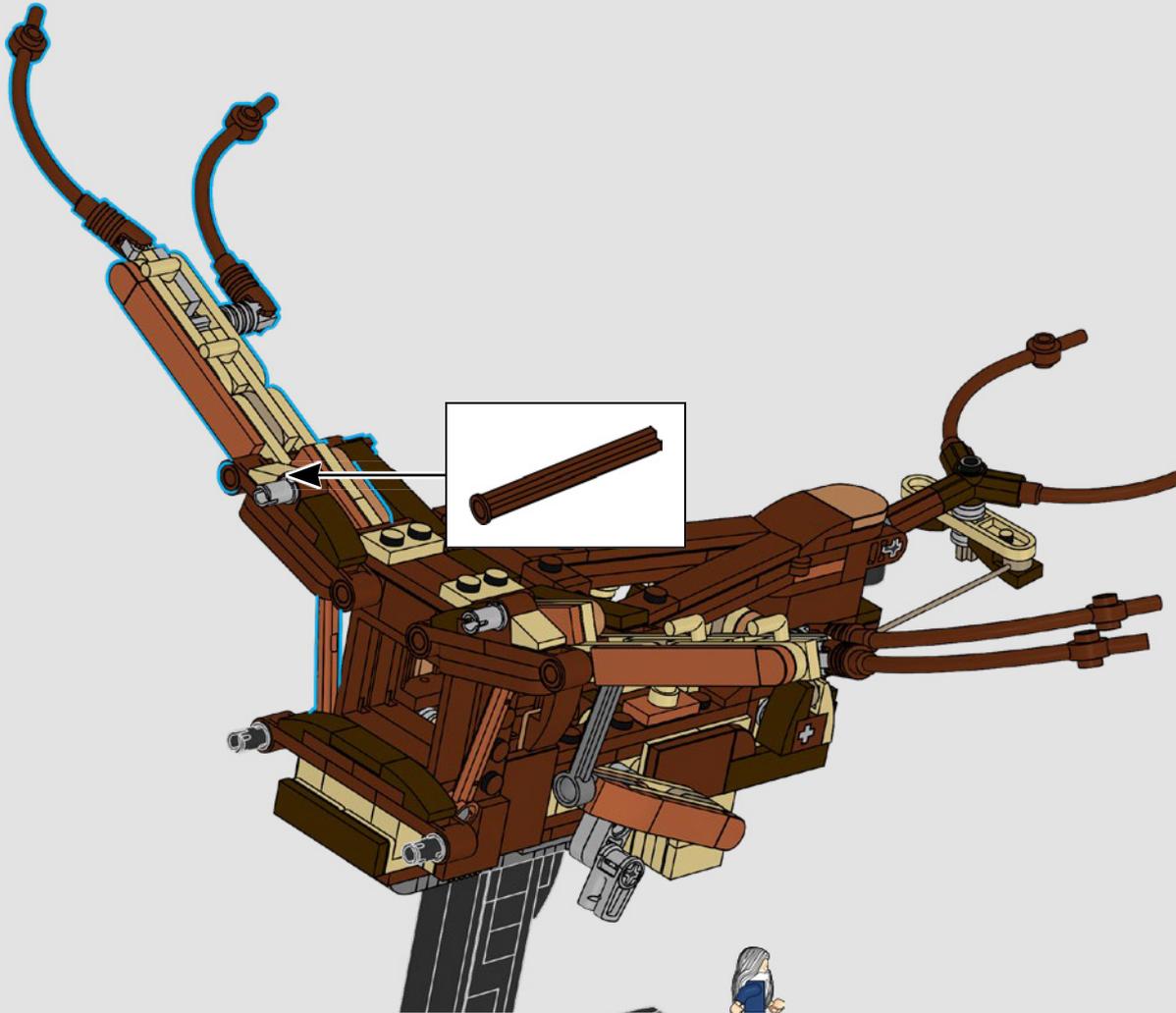


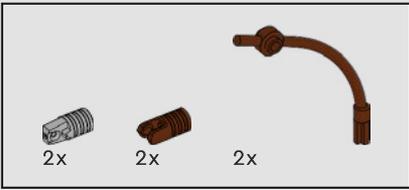
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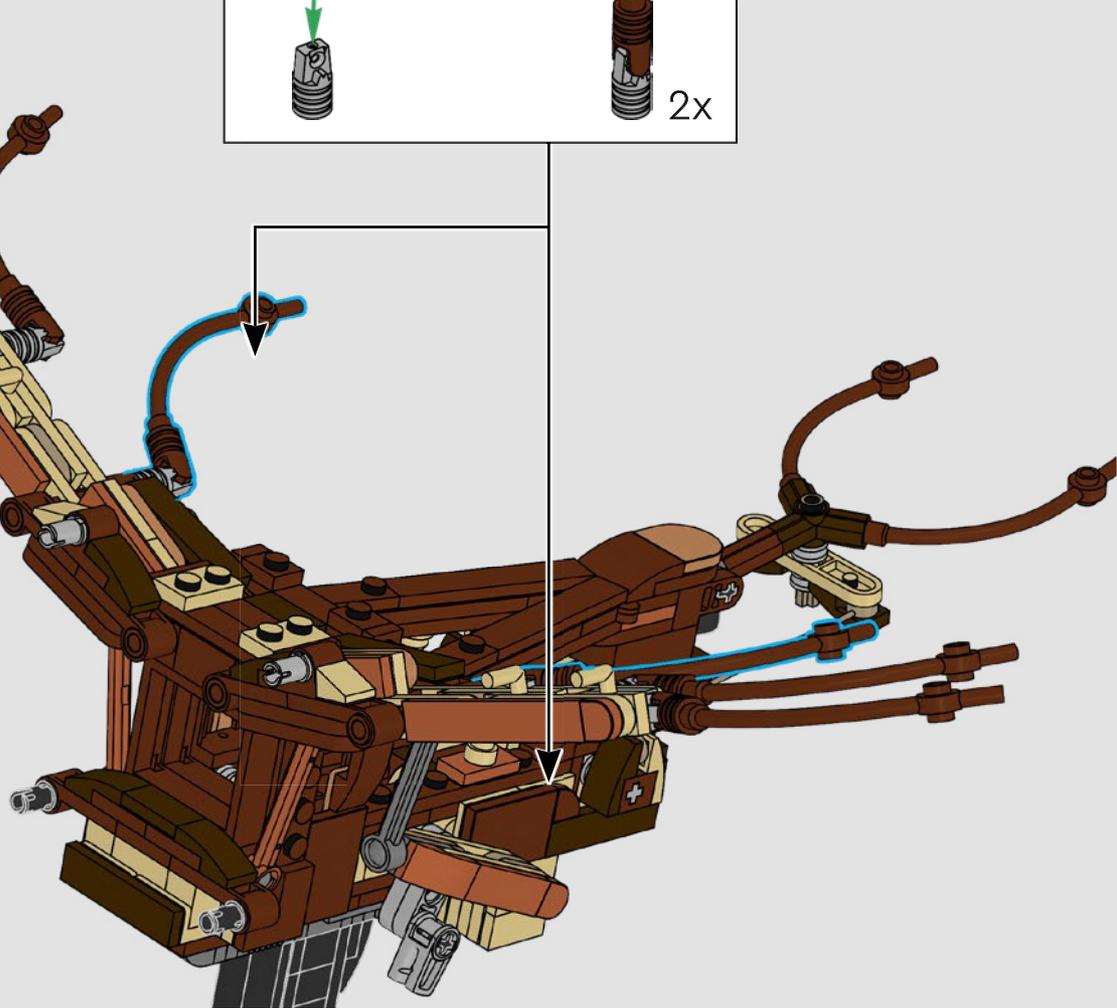
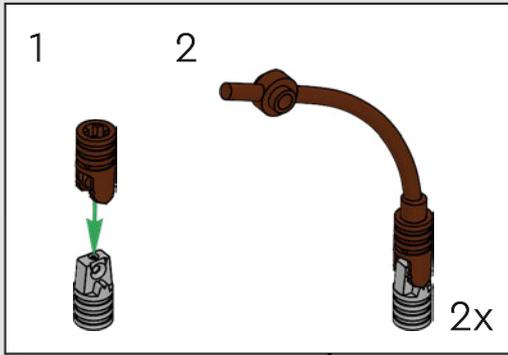


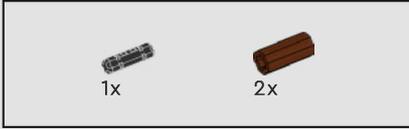
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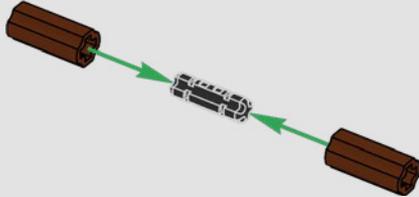


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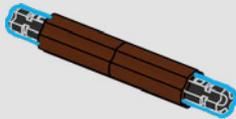




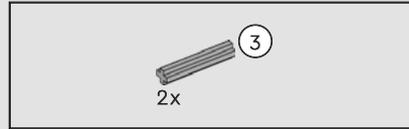
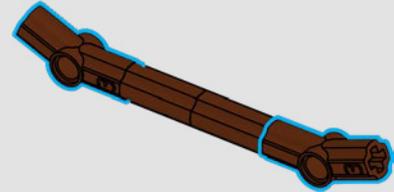
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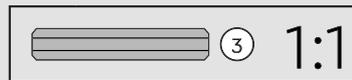
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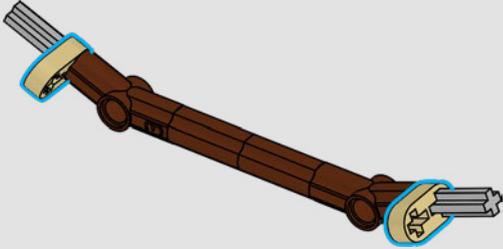


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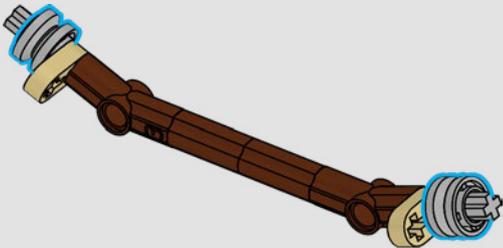




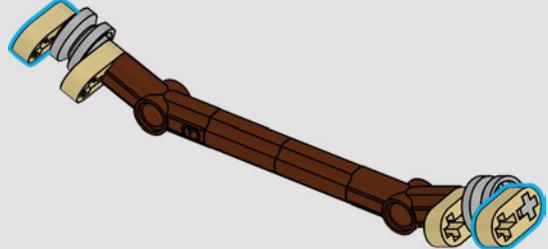
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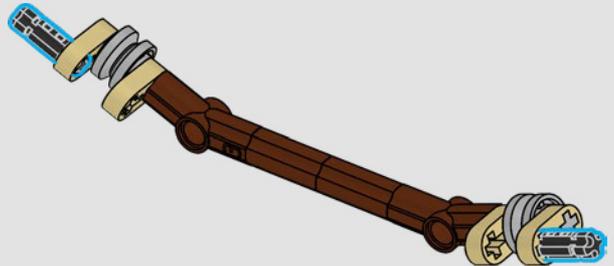
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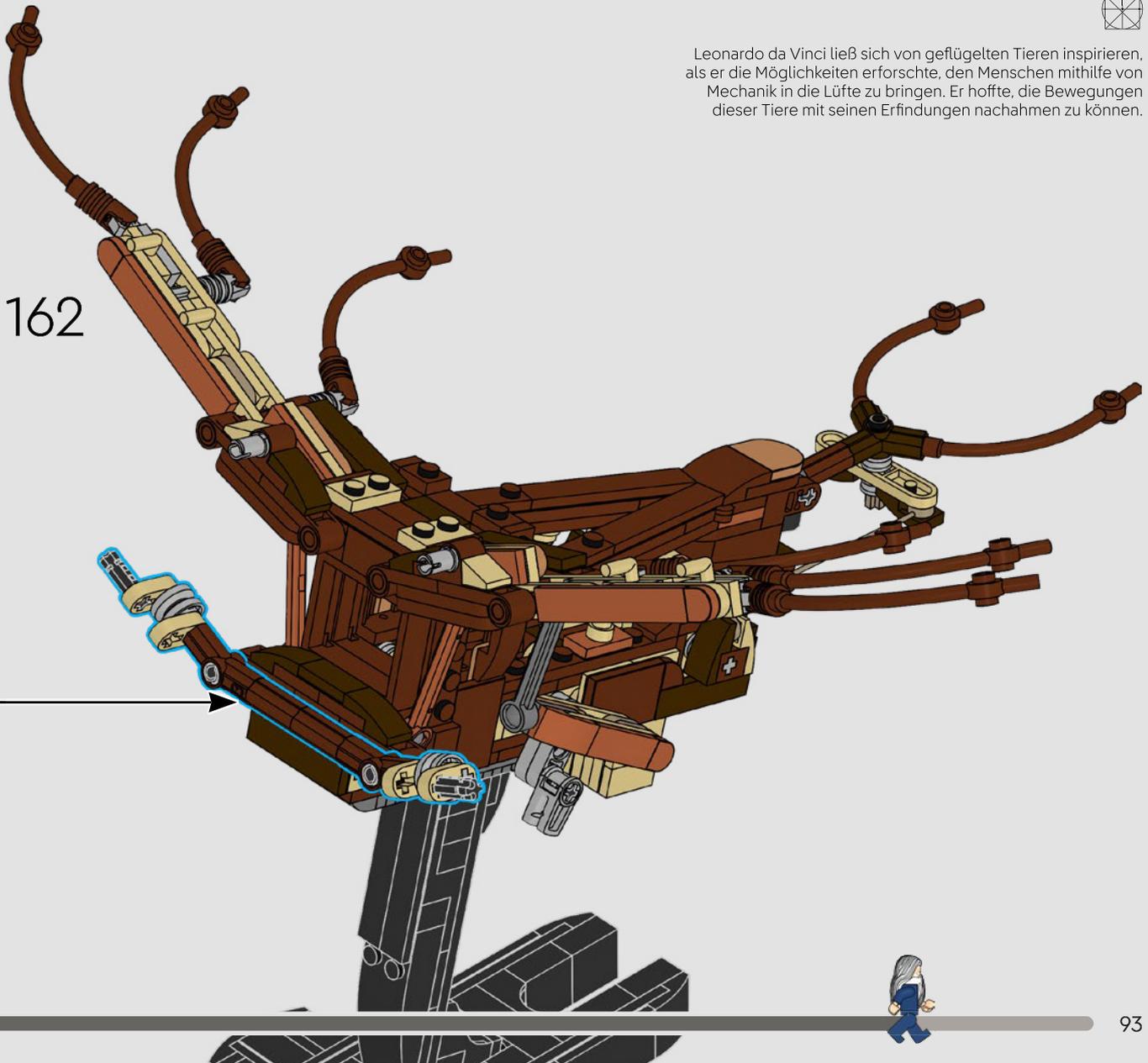
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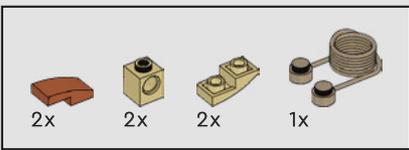




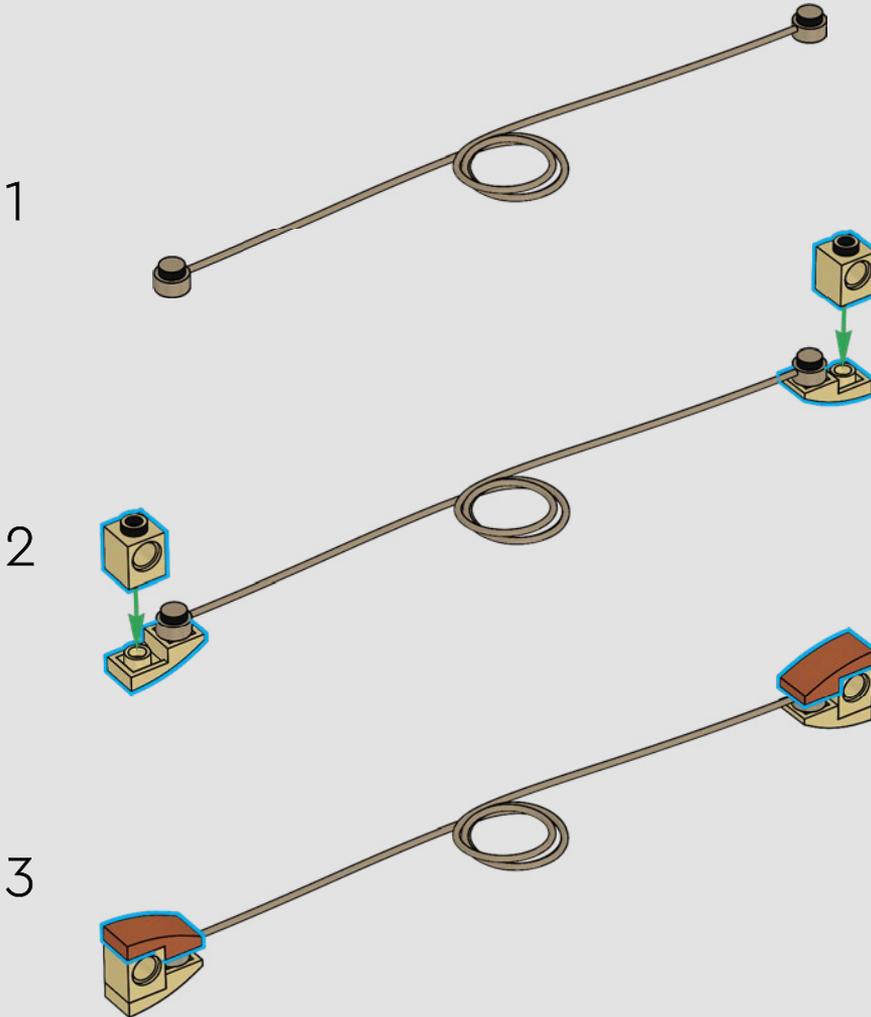
Leonardo da Vinci ließ sich von geflügelten Tieren inspirieren, als er die Möglichkeiten erforschte, den Menschen mithilfe von Mechanik in die Lüfte zu bringen. Er hoffte, die Bewegungen dieser Tiere mit seinen Erfindungen nachahmen zu können.

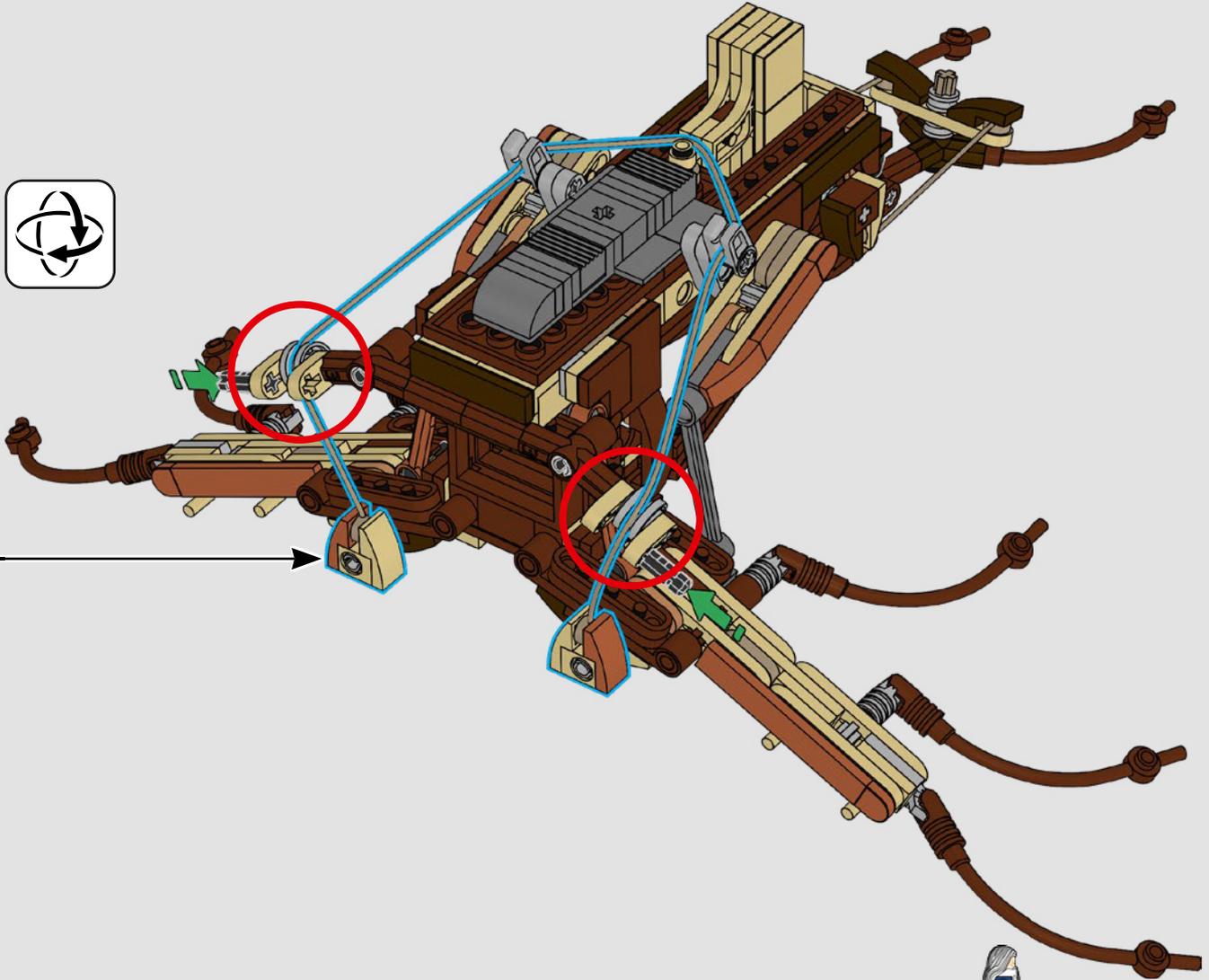
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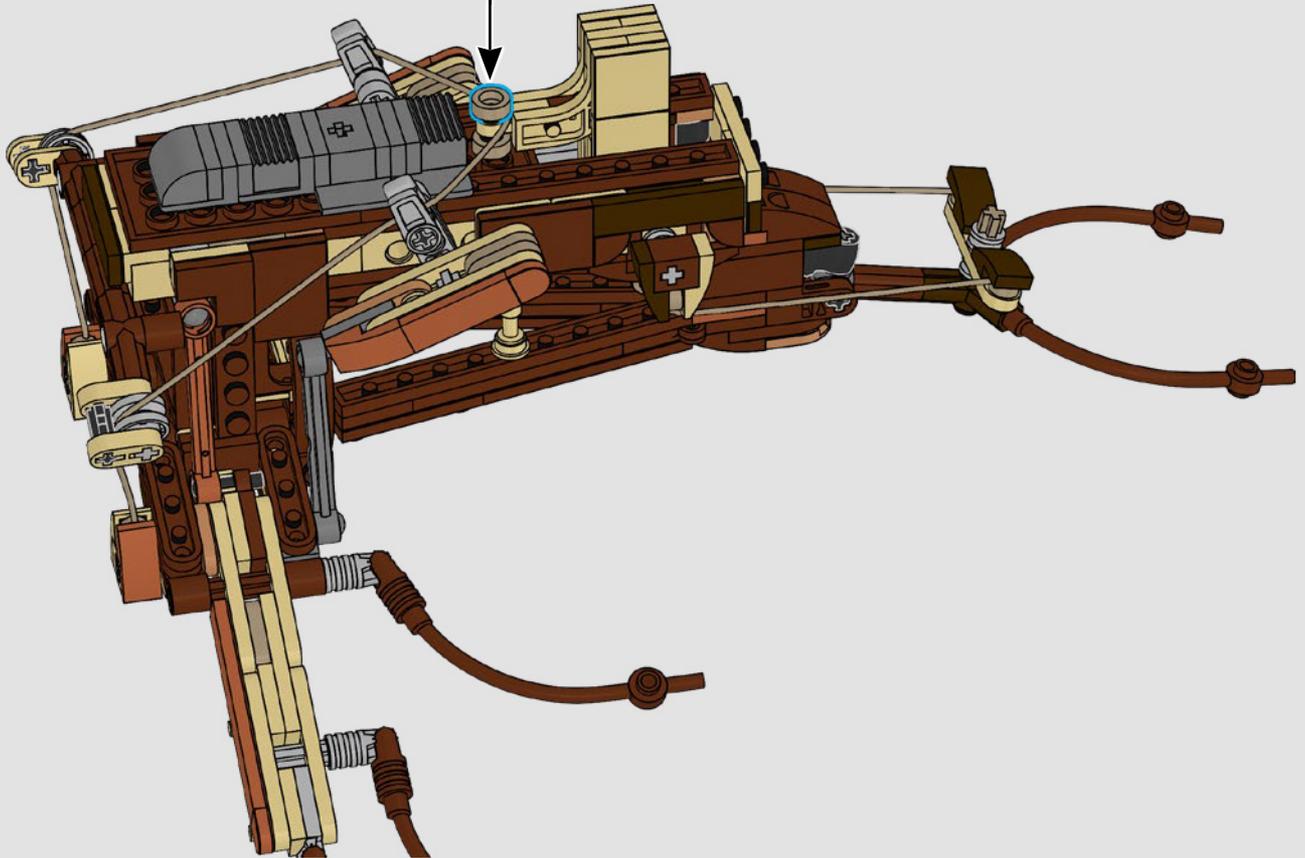




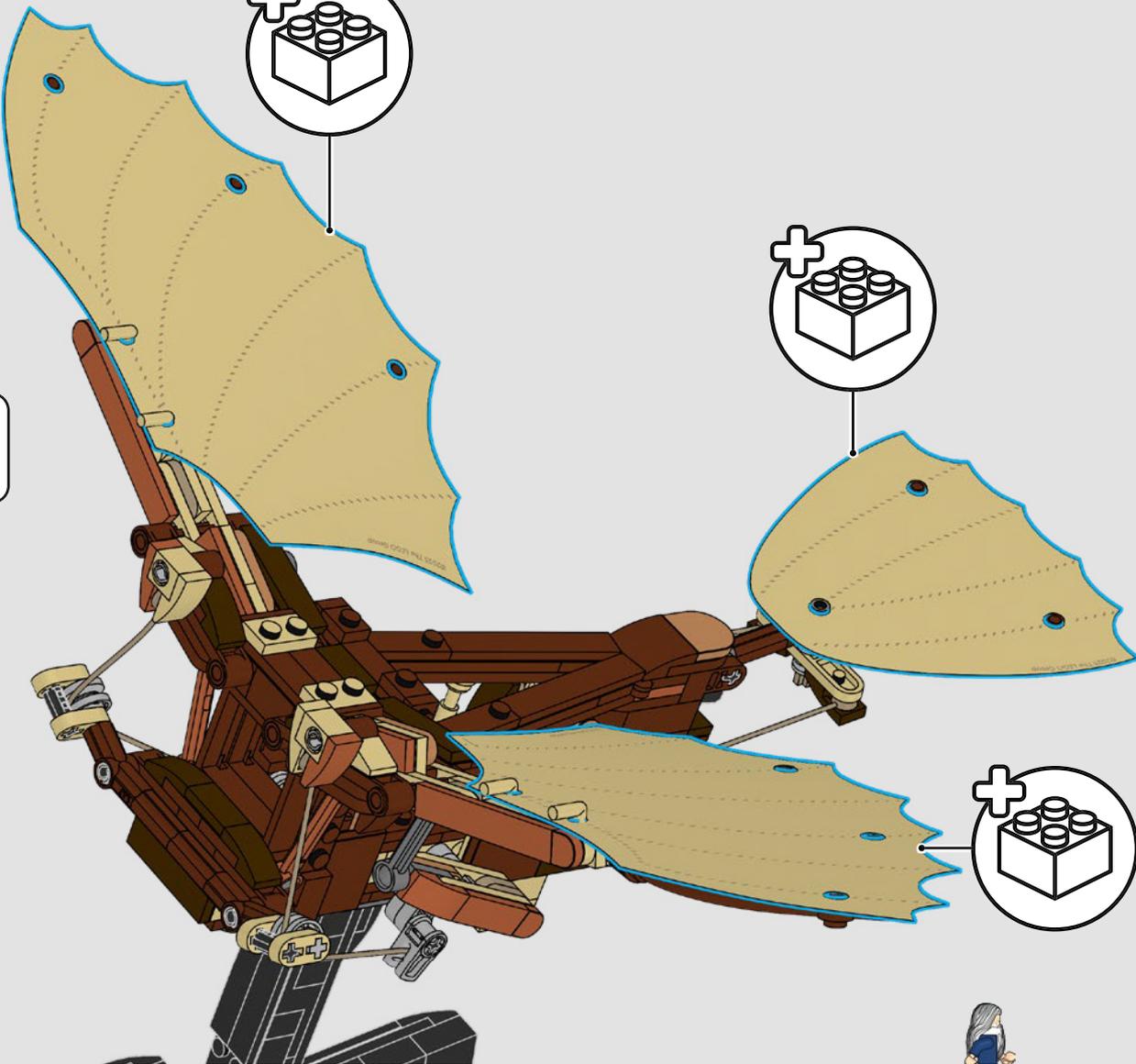
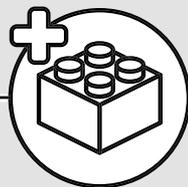
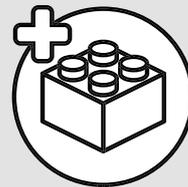
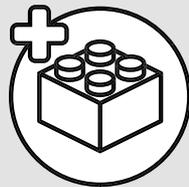


1x

164



165



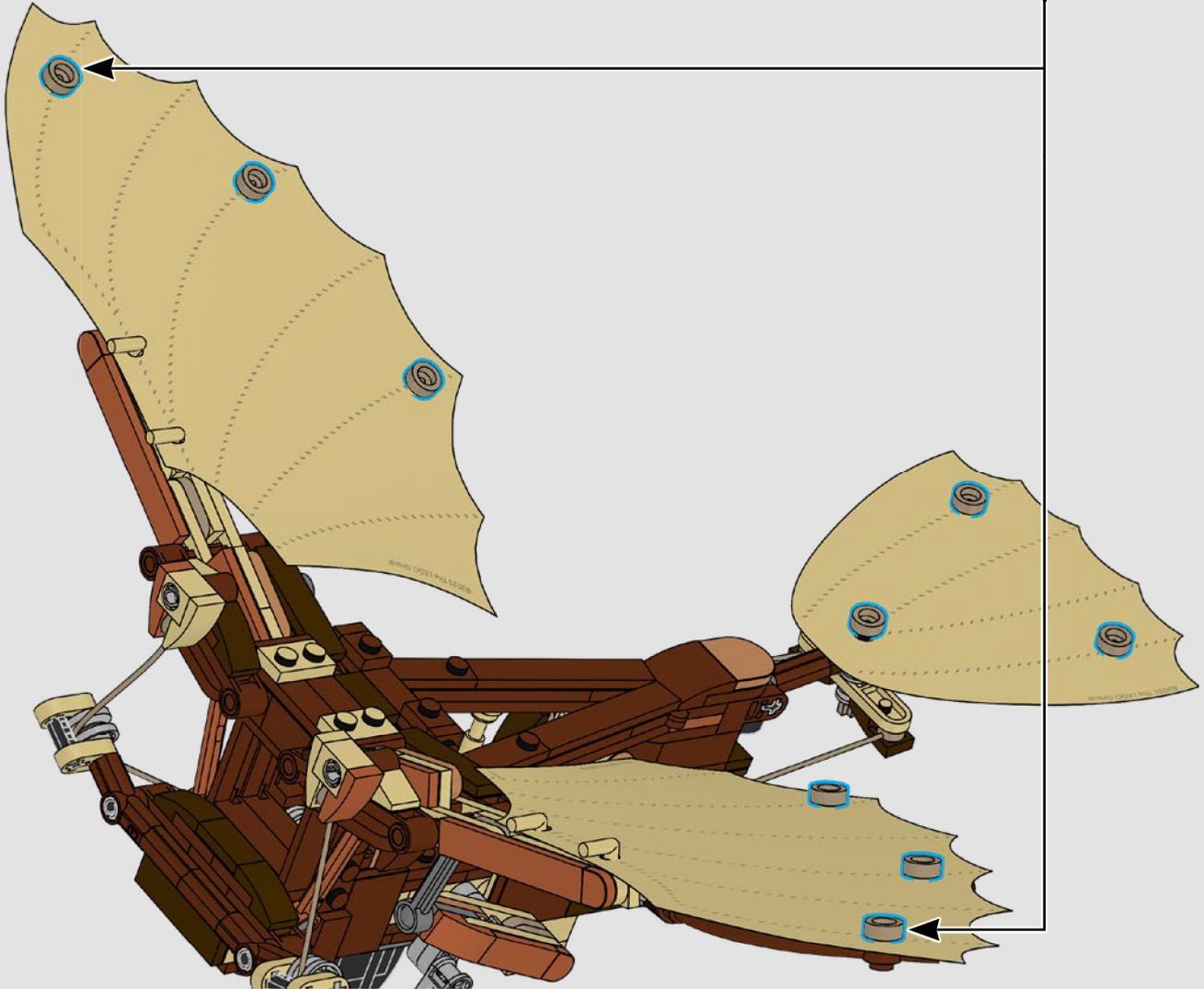


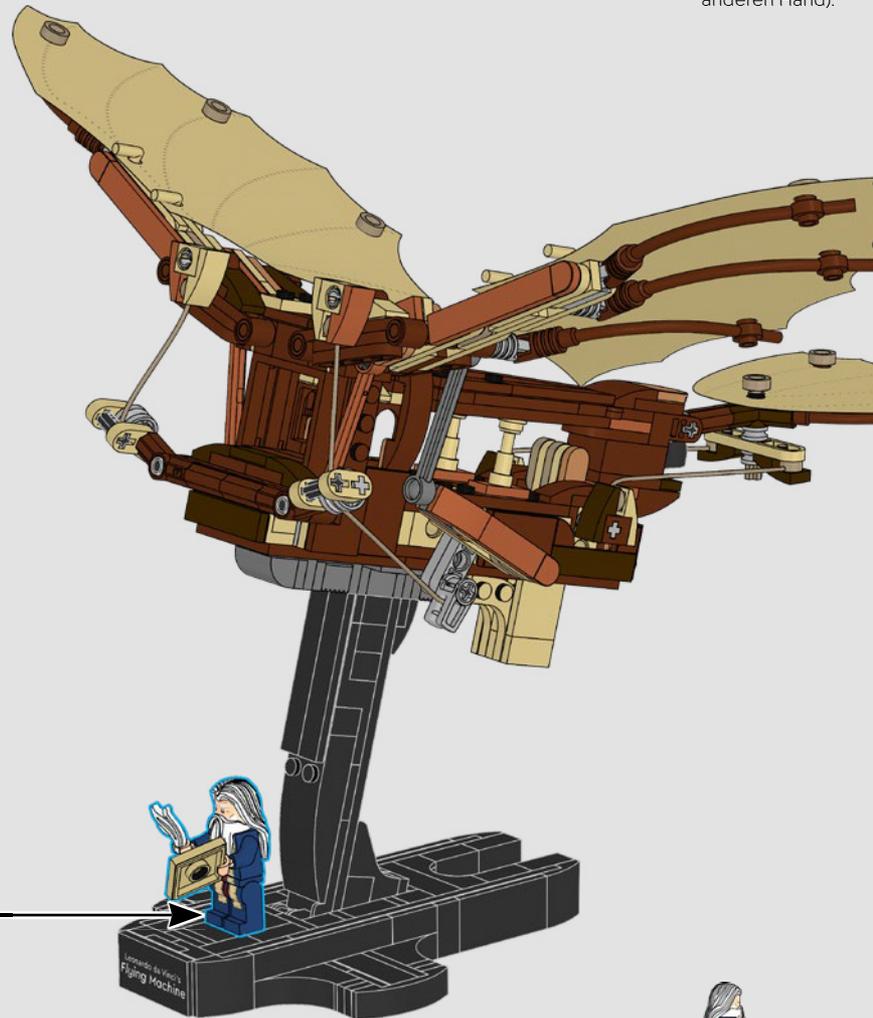
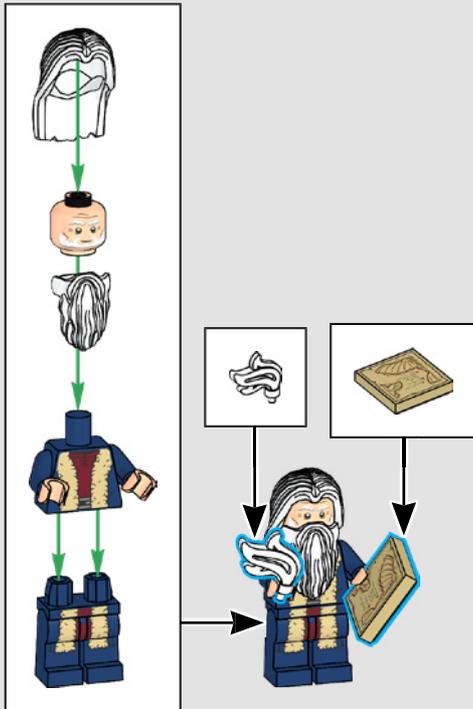
9x



9x

166



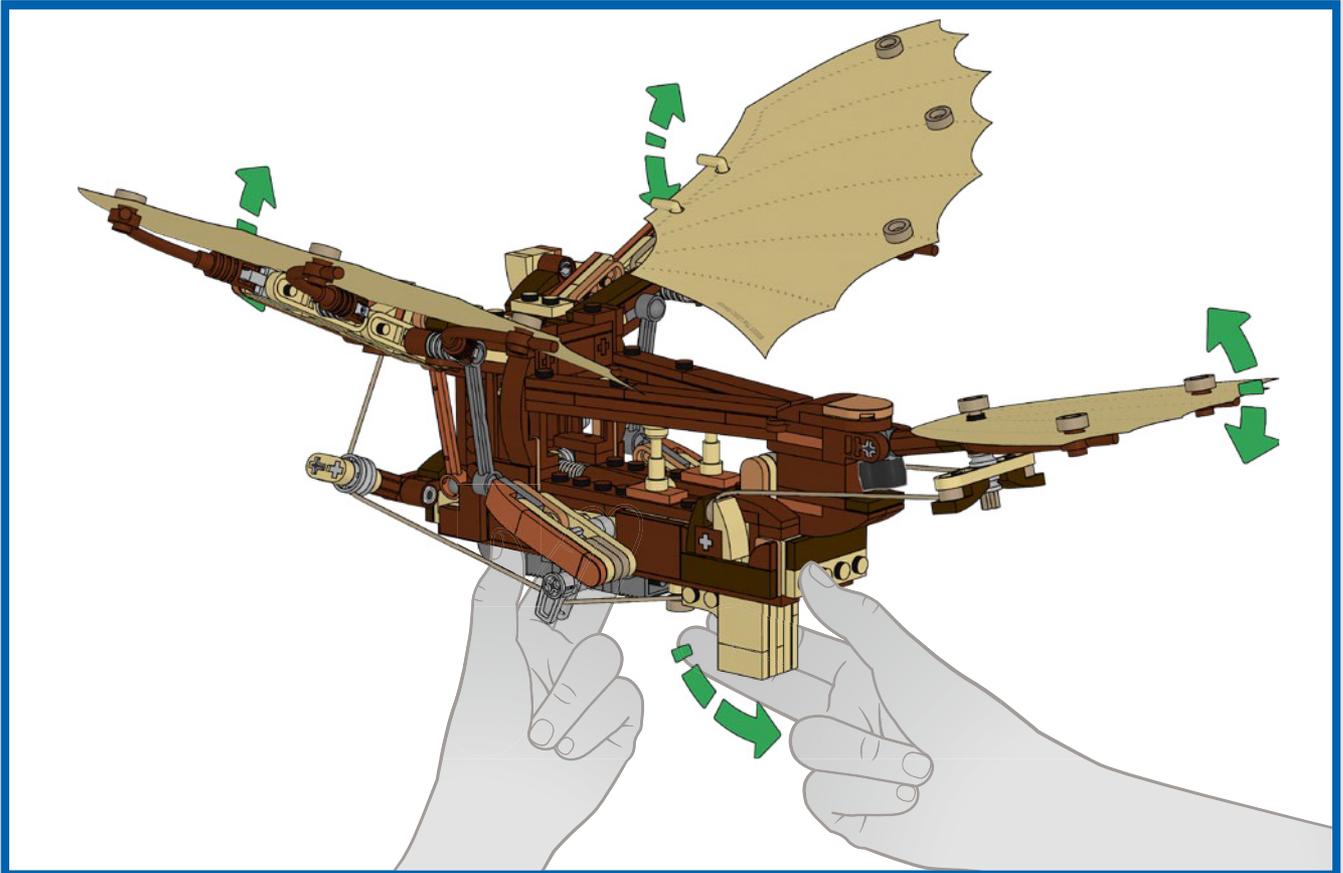


Das Modell wurde so konzipiert, dass es mindestens drei Möglichkeiten für das Betätigen des Abzugshebels gibt:  
 auf dem Ständer, in einer Hand oder in beiden Händen  
 (mit einer Hand am Abzugshebel und dem Modell in der anderen Hand).





Eine der Designherausforderungen bestand darin, die richtige Stelle für den Abzugshebel der Flügelschlagfunktion herauszufinden, damit die Baumeister weder den mechanischen Teilen noch den Schnüren ins Gehege kommen.



2x 6424674  
2x 654126  
10x 302426  
2x 6509664  
9x 4109810  
2x 6279875  
1x 4198367  
2x 6114987  
7x 6178922  
4x 302326  
8x 306926  
10x 6275806  
2x 6192309  
2x 6147050

6x 302226  
3x 300326  
4x 6053077  
3x 6469445  
1x 6321745  
2x 4581280  
4x 6154860  
2x 365926  
2x 4613153  
1x 6258904  
1x 300126  
2x 4560182

2x 362326  
1x 6562781  
1x 6533639  
4x 663626  
1x 4180548  
2x 346026  
3x 4514845  
1x 611226  
1x 244526  
1x 6523326  
1x 6530674

6x 6380634  
3x 6507790  
1x 6513939  
4x 6492538  
3x 4206482  
1x 4142865  
2x 6129995  
6x 6443061  
1x 6167923  
4x 4516055  
2x 4179771  
6x 6376461  
2x 6352222  
1x 6281995  
15x 4113917  
2x 4523145

4

4x 6261357  
4x 6251252  
1x 4114026  
2x 6060850  
2x 6313611  
8x 6117975  
2x 4114084  
2x 6013081  
1x 6523327  
2x 4121921  
1x 4159739  
2x 4234365  
6x 4113233

2x 6397561  
15x 6311104  
1x 4114309  
1x 6122047  
2x 4112982  
1x 6519042  
1x 6522105  
1x 6522103  
1x 6522097

- 4x 6359273
- 2x 6092602
- 4x 6186009
- 2x 4615606
- 4x 6340118
- 2x 6523583
- 2x 6359696
- 1x 6315564
- 1x 6289366
- 1x 6353972
- 11x 6300320
- 8x 6231386
- 2x 6330148
- 1x 6184880
- 1x 6031821
- 1x 6532367
- 2x 6533185
- 1x 6240515

- 11x 4221744
- 4x 6149677
- 8x 6397610
- 2x 6472546
- 6x 6503738
- 3x 4531751
- 8x 4211150
- 2x 6138664
- 2x 6063447
- 2x 6502370
- 2x 6459597
- 2x 6221608
- 3x 6146858

- 2x 6261388
- 10x 6415991
- 1x 6534905
- 2x 6172636
- 6x 6463591
- 4x 6311441
- 3x 4211189
- 1x 4216668
- 4x 4211190
- 4x 4658005
- 5x 6257604
- 2x 4595889

- 2x 6092566
- 4x 6416695
- 1x 4211201
- 4x 6159763
- 8x 6516553
- 4x 4221590
- 2x 4211204
- 4x 4629920
- 4x 4216945
- 2x 4271874
- 2x 4223683

- 1x 6005331
- 2x 4210636
- 4x 4211063
- 1x 6302690
- 1x 6178919
- 2x 6039479
- 2x 6308045
- 4x 6123814
- 2x 6118832
- 2x 4629920
- 6x 4566688
- 8x 6046943
- 1x 6273219
- 6x 6313874

- 1x 6523324
- 6x 6271165
- 2x 6335328
- 2x 4211758
- 4x 6265704
- 2x 4211807
- 2x 6471951
- 4x 6360043
- 2x 6266231
- 4x 4211815
- 4x 4211429
- 1x 4211396
- 1x 4211805
- 1x 4535768



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