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"We flew down the hill, Orv," Will said breathlessly.

"We flew," Orv repeated.

# BROTHERS

PIONEERS OF AMERICAN AVIATION

BY QUENTIN REYNOLDS

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1

#### **Learning from Mother**

Susan Wright wasn't like other mothers.

She was younger and prettier than most other mothers, and she liked to laugh and she liked to play games with her three youngest children: Wilbur, who was eleven; Orville, who was seven; and Katharine, who was four.

The other mothers would shake their heads and say, "Susan Wright spoils those children; lets 'em do anything they want. No good will come of it."

But Susan Wright only laughed. In the summer she'd pack a picnic lunch and she, the two boys, and little Kate (no one ever called her Katharine) would go and spend a day in the woods. Mrs. Wright knew the name of every bird and she could tell a bird by his song. Wilbur and Orville learned to tell birds too.

One day they sat on the banks of a river near Dayton, where they lived. Wilbur and Orville were fishing. Everyone called Wilbur "Will," and of course Orville was "Orv." The fish weren't biting very well. Suddenly a big bird swooped down, stuck his long bill into the river, came out with a tiny fish, and then swooped right up into the sky again.

"What makes a bird fly, Mother?" Wilbur

asked.

"Their wings, Will," she said. "You notice they move their wings and that makes them go faster."

"But Mother," Will said, not quite satisfied, "that bird that just swooped down didn't even move his wings. He swooped down, grabbed a fish, and then went right up again. He never moved his wings at all."

"The wind doesn't just blow toward you or away from you," she said. "It blows up and down too. When a current of air blows up, it takes the bird up. His wings support him in

the air."

"If we had wings, then we could fly too, couldn't we, Mother?" Wilbur asked.

"But God didn't give us wings." She

laughed.

"Maybe we could make wings," Wilbur insisted.

"Maybe," his mother said thoughtfully.
"But I don't know. No one ever did make wings that would allow a boy to fly."

"I will someday," Wilbur said, and Orville

nodded and said, "I will too."

"Well, when you're a little older maybe

you can try," their mother said.

That was another thing about Susan Wright. Most other mothers would have thought that this was foolish talk. Most other mothers would have said, "Oh, don't be silly, who ever heard of such nonsense!" But not Susan Wright. She knew that even an eleven-year-old boy can have ideas of his own, and just because they happened to come from an eleven-year-old head—well, that didn't make them foolish. She never treated her children as if they were babies, and perhaps that's why they liked to go fishing with her or on picnics with her. And that's why they kept asking her questions.

She always gave them sensible answers.

They asked their father questions too, but he was a traveling minister and he was away a lot.

"It's getting chilly," Mrs. Wright said suddenly. "Look at those gray clouds, Will."

Wilbur looked up. "It's going to snow, I

bet," he said happily.

"No more picnics until next spring," his mother said. "Yes, it looks like snow. We'd better be getting home."

As they reached home, the first big white snowflakes started to fall. They kept falling all that night and all the next day. It was the first

real snowstorm of the year.

In the morning the wind was blowing so fiercely that Wilbur found it hard to walk to the barn where the wood was stored. The wind was so strong it almost knocked him down. He burst through the kitchen door with an armful of wood for the stove, and he told his mother about the wind.

"The thing to do is to lean forward into the wind," she said. "Bend over, and that way you get closer to the ground and you get under the wind."

That night when Wilbur had to make the

trip for more wood, he tried his mother's idea. To his surprise, it worked! When he was bent over, the wind didn't seem nearly so strong.

After a few days the wind stopped, and now the whole countryside was covered with snow. Wilbur and Orville, with little Kate trailing behind, hurried to the Big Hill not far from the house.

Orville's schoolmates were all there with their sleds. It was a good hill to coast down because no roads came anywhere near it, and even if they had, it wouldn't have mattered. This was 1878 and there were no automobiles. Horse-drawn sleighs traveled the roads in winter. The horses had bells fastened to their collars. As they jogged along, the bells rang and you could hear them a mile away.

Most of the boys had their own sleds; not the kind boys have now, but old-fashioned sleds with two wooden runners. No one ever thought of owning a "bought" sled. In those days a boy's father made a sled for him.

The boys who had sleds of their own let Wilbur and Orville ride down the hill with them. Ed Sines and Chauncey Smith and Johnny Morrow and Al Johnston all owned sleds, but they liked to race one another down the long hill. When this happened, Wilbur and Orville just had to stand there and watch. Late that afternoon the boys came home, with Kate behind them, and their mother noticed that they were very quiet. She soon found out why they were unhappy.

"Why doesn't Father build us a sled?"

Wilbur blurted out.

"But Father is away, Will," his mother said gently. "And you know how busy he is when he is at home. He has to write stories for the church paper and he has to write sermons. Now suppose we build a sled together."

Wilbur laughed. "Whoever heard of any-

one's mother building a sled?"

"You just wait," his mother said. "We'll build a better sled than Ed Sines has. Now get me a pencil and a piece of paper."

"You goin' to build a sled out of paper?"

Orville asked in amazement.

"Just wait," she repeated.

2

#### "Get It Right on Paper"

Will and Orv brought their mother a pencil and paper, and she went to the minister's desk and found a ruler. Then she sat down at the kitchen table. "First we'll draw a picture of the sled," she said.

"What good is a picture of a sled?" Orville asked.

"Now Orville, watch Mother." She picked up the ruler in one hand and the pencil in the other.

"We want one like Ed Sines has," Orville said.

"When you go coasting, how many boys will Ed Sines's sled hold?" she asked.

"Two," Wilbur said.

"We'll make this one big enough to hold three," she said. "Maybe you can take Kate along sometimes." The outline of a sled began to appear on the paper. As she drew it she talked. "You see, Ed's sled is about four feet long. I've seen it often enough. We'll make this one five feet long. Now, Ed's sled is about a foot off the ground, isn't it?"

Orville nodded, his eyes never leaving the drawing that was taking shape. It was beginning to look like a sled now, but not like the

sleds the other boys had.

"You've made it too low," Will said.

"You want a sled that's faster than Ed's sled, don't you?" His mother smiled. "Well, Ed's sled is at least a foot high. Our sled will be lower—closer to the ground. It won't meet so much wind resistance."

"Wind resistance?" It was the first time Wilbur had ever heard the expression. He

looked blankly at his mother.

"Remember the blizzard last week?" she asked. "Remember when you went out to the woodshed and the wind was so strong you could hardly walk to the shed? I told you to lean over, and on the next trip to the

woodshed you did. When you came back with an armful of wood you laughed and said, 'Mother, I leaned 'way forward and got under the wind.' You were closer to the ground and you were able to lessen the wind resistance. Now, the closer to the ground our sled is, the less wind resistance there will be, and the faster it will go."

"Wind resistance . . . wind resistance," Wilbur repeated, and maybe the airplane was born in that moment. Certainly neither Will nor Orville Wright ever forgot that first lesson in speed.

"How do you know about these things, Mother?" Wilbur asked.

"You'd be surprised how much mothers know, Will." She laughed. She didn't tell the boys that when she was a little girl at school her best subject had been arithmetic. It just came naturally to her. It was the same when she went to high school. And when she went to college, algebra and geometry were her best subjects. That was why she knew all about things like wind resistance.

Finally she finished the drawing. The boys leaned over the table to look at it. This sled was going to be longer than Ed's sled and much narrower. Ed's sled was about three feet wide. This one looked as if it would be only half that wide.

"You made it narrow," Wilbur said shrewdly, "to make it faster. The narrower it is, the

less wind resistance.'

"That's right." His mother nodded. "Now let's put down the exact length of the runners and the exact width of the sled."

"But that's only a paper sled," Orville

protested.

"If you get it right on paper," she said calmly, "it'll be right when you build it.

Always remember that."

"'If you get it right on paper, it'll be right when you build it,'" Wilbur repeated, and his mother looked at him sharply. Sometimes Will seemed older than his eleven years. Little Orville was quick to give you an answer to anything, but as often as not he'd forget the answer right away. When Will learned something he never forgot it.

"Mother, you make all your clothes," Wilbur said thoughtfully. "You always make a

drawing first."

"We call that the pattern," his mother said.
"I draw and then cut out a pattern that's

exactly the size of the dress I am going to make. And . . ."

"If the pattern is right, it'll be right when you make the dress," he finished. She nod-ded.

"Now you two boys get started on your sled." She smiled. "There are plenty of planks out in the barn. Find the very lightest ones. Don't use planks with knots in them. You saw the planks to the right size, Will—don't let Orville touch the saw."

"May we use Father's tools?" Wilbur asked breathlessly.

His mother nodded. "I don't think your father will mind. I know you'll be careful with them. Just follow the drawing exactly," she warned once more.

The two boys and Kate hurried out to the barn. They realized that this was an important occasion. Wilbur always chopped the wood for the stove when his father was away, but he had never been allowed to use the gleaming tools that lay in his father's tool chest.

Three days later their sled was finished. They pulled it out of the barn and asked their mother to inspect it. She had her tape measure with her and she measured it. The runners were exactly the length she had put down in her drawing. In fact, the boys had followed every direction she had given them. The runners gleamed. Orville had polished them with sandpaper until they were as smooth as silk.

"We thought of one other thing, Mother," Will said. "We found some old candles in the woodshed. We rubbed the runners with the candles. See how smooth they are?"

Mrs. Wright nodded. She had forgotten to tell the boys that, but they'd thought it out for themselves. "Now try your sled," she told them.

Followed by Kate, the boys dragged their new sled to the hill only half a mile away where their pals were coasting. They looked at the new sled in amazement. It was long and very narrow. It looked as though it wouldn't hold anyone. The runners were thin compared to those on their own sleds.

"Who made that for you?" Ed Sines asked.

"Mother showed us how," Wilbur said proudly. Some of the boys laughed. Whoever heard of a boy's mother knowing how to make a sled? "It looks as if it would fall apart if you sat on it," Al Johnston said, and he laughed too.

"Come on, we'll race you down the hill,"

another cried out.

"All right, two on each sled," Wilbur said. He wasn't a bit afraid. He was sure the drawing had been right, and because he and Orv had followed the drawing, he knew that the sled was right.

They lined the four sleds up. Will and Orv sat on their sled, but it didn't "fall apart."

Suddenly Wilbur got an idea.

"Get up, Orv," he said. "Now lie down on the sled . . . that's it . . . spread your legs a bit." Will then flopped down on top of his brother. "Less wind resistance this way," he whispered.

"Give us all a push," Ed Sines yelled.

And then they were off. It was an even start. The four sleds gathered speed, for at the top the slope was steep. Will looked to the right. Then to the left. He brushed the stinging snow out of his eyes but he couldn't see the other sleds. He looked behind. They were straggling along, twenty and now thirty feet in back of him. The new sled skimmed along, the runners singing happily. Both Will

and Orv felt a strange thrill of excitement. They approached the bottom of the long hill. The other sleds were far, far behind now.

Usually when the sleds reached the bottom of the hill they slowed down abruptly and stopped. But not this sled. It kept on; its momentum carried it on and on a hundred yards farther than any of the other sleds had ever reached. Finally it stopped.

Shaking with excitement, Will and Orv

stood up.

"We flew down the hill, Orv," Will said breathlessly.

"We flew," Orv repeated.

Now Ed and Al and Johnny ran up, excited at what had happened. No sled had gone so far or so fast as the one Will and Orv had built.

"You flew down the hill," Ed Sines gasped.

"Let me try it?"

Wilbur looked at Orv, and some secret message seemed to pass between them. They had built this sled together, and it was the best sled there was. They'd always work together building things.

"Orv," Will said, "I've got an idea. This sled can do everything but steer. Maybe we

can make a rudder for it. Then we can make it go to the right or to the left."

"We'll get Mother to draw one," Orv said.

"We'll draw one, you and I," Wilbur said.
"We can't run to Mother every time we want to make something."

By now little Kate had come running down the hill.

"You promised," she panted. "You said you'd take me for a ride."

"Come on, Kate." Will laughed. "The three of us will coast down once. And then you can try it, Ed."

They trudged up the hill, pulling the sled. Two words kept singing in Wilbur's ears. "We flew . . . we flew . . . . "

### 3

#### **Building a Wagon**

The Reverend Milton Wright came home a few days later. Before he had his coat off he had to look at the new sled. He had to hear the story of how it had been made and how it was the fastest sled on the Big Hill.

"I let the boys use your tools," Susan

Wright said.

There was a moment of silence. Reverend Wright liked to make things. He'd even made a typewriter once. He was very proud of his shining chisels, and sharp saws, and of his clean workbench out in the barn.

"You let the boys use my tools?" He was

amazed.

"Yes, Father," Susan Wright said, while Will and Orv stood there feeling very nervous.

Without another word he turned and left the room. They heard him walking across the yard to the barn. It was ten minutes before he returned. He looked at the solemn faces of his two sons.

"You didn't hurt them any," he said with a twinkle in his eye. "As a matter of fact, someone sharpened some of my old chisels."

"When we were finished we sharpened all

the tools," Will said eagerly.

"I felt they were old enough to take care of the tools," Mrs. Wright said.

"I guess you were right, Mother." Rever-

end Wright smiled.

"We want to use them again," Orv blurted out. "We want to make our sled steer."

"We want to build a rudder," Wilbur

explained.

"Whoever heard of a rudder on a sled?"

their father wanted to know.

"Father, we saw a picture of a boat in one of our schoolbooks," Wilbur said. "It had a rudder at the back. Maybe we can make a rudder that will steer our sled." "Well, I don't know," his father said doubt-

fully.

"But look, Father." Wilbur ran to his father's desk and picked up a large piece of paper from it. "See? We drew a lot of pictures of a rudder and we think this one is the best."

"Let me see it." Reverend Wright looked at the neat drawing of a rudder. The measurements were all there in tiny penciled figures. It was to be a wooden rudder with a tiller. The rudder was attached to the back of the sled by two iron rings. Reverend Wright looked at his wife quickly.

"Bless my soul," he muttered. "They have

your gift for drawing."

"They did this by themselves," she said proudly. "I didn't help them."

"It looks all right to me," Reverend Wright

said.

"If it's right on paper, it'll be right when you make it," Wilbur said stoutly. "And we made a lot of drawings before we settled on this one."

"Where will you get the two iron rings?"

their father asked.

"At the junk yard," Wilbur said. "Mr. Carmody gave them to us. And Father, when

winter is over we're going to work for him. We're going to build a wagon and collect junk from the farmers and bring it to him."

"Well, one thing at a time. First see how your rudder works out," their father said.

"But Father . . ." Wilbur hesitated.

"I know. The tools," his father supplied, laughing. "Go on, boys, use the tools, but don't get hurt."

Soon the rudder wasn't just a drawing. It came into being out in the barn, and when the boys attached it to the back of the sled it just fitted. Once again the boys learned the truth of what their mother had said. They had been right to take so much time on their drawing.

That afternoon they tried the sled on the Big Hill. The other boys looked with curiosity at the odd thing attached to the back of the Wright boys' sled, but they didn't laugh. They would never laugh at the Wright brothers again. The sled, with Will holding the tiller, started to speed down the hill. Will turned the rudder and the sled swerved to the left; he turned it again and the sled swerved to the right. They could steer their sled, just as you could steer a boat.

That night a thaw set in. Then it rained for a whole week, a soft warm rain that washed away the snow and drowned the winter. Will and Orv trudged home from school every day over the muddy roads. They were no sooner home than they hurried to get their homework out of the way. They didn't like homework any more than anyone else did, but they knew it had to be done so they did it fast.

History, geography, spelling—these came slowly to the boys. But arithmetic was easy for them, and as they quickly finished the problems their teacher had given them, their mother smiled happily. Like their father, they enjoyed making things and they were happiest when they had tools in their hands. But their father was a great scholar who spoke and wrote beautiful English. He hadn't passed this on to his sons. And it was hard for him to add up a column of figures. The boys could do that easily. In this way they were like their mother.

Each day, after they had spent a half-hour or so on their homework, Orv would look up. "You finished, Will?" he would ask. Orv was always finished first. His grades were never as high as Will's, but he was very quick. Will took a little more time to think things out, but he nearly always gave the right answer.

Homework done, the boys would run to the barn to get through their chores. The wood box in the kitchen seemed to empty itself every few minutes. Their father had told them sternly, "Keep the wood box filled," and this was a job they never neglected. Will would saw the wood and then split the logs with an ax. He had a keen eye and he never missed. The sawed log would split in two as the sharp blade of the ax hit it. After that, Orv would gather up the split wood and run with it to the kitchen.

"That's enough, Will," he'd cry when the box beside the kitchen stove was full. Then Will would clean the ax and hang it in its place over the workbench.

Then both boys would run into the kitchen. "Wash your hands," their mother would call, and they'd hurry through that too. Finally they'd get paper, pencils, and ruler and sit down at the kitchen table. There was no hurrying them now. They were building a wagon, and a great deal depended upon this wagon.

Will and Orv had made a bargain with Mr.

Carmody, the junkman. He had told them that a lot of farmers in the outlying sections had junk to sell. Mr. Carmody didn't have a horse and buggy. And he didn't have time to go and see the farmers; he had to stay in his junk yard sorting out the metal and wooden articles that people sold him.

But if Wilbur and Orville had a wagon, they could go and pick up the things that the farmers couldn't use. The junkman would pay the boys for delivering the broken axes, the worn-out nuts and bolts, the broken chains, and wrecked bicycles that the farmers hadn't time to repair themselves. That was why the wagon was important to Will and Orv. Once they had a wagon they could go into business.

They had studied the wagons owned by their father's friends. Their wagon would have to be very light because they would have to pull it. It would have to be strong enough to carry iron and heavy metal of all kinds. The grocer in Dayton had a nice wagon, and they thought of copying it until they realized that the wheels were covered with strips of metal. These were "bought wheels," and the two boys didn't have any money to buy anything.

"We'll just have to make wooden wheels," Wilbur said, a bit discouraged.

Orv shook his head. "Ed Sines has a wagon with wooden wheels. Yesterday he lent it to me and I gave Kate a ride. I could hardly pull it at all. Wooden wheels are no good."

"Some of the farmers have ox carts that

have wooden wheels," Wilbur said.

"But they have oxen to pull them," Orv reminded him. And then he had an idea. "You know what, Will?"

"What?" Wilbur had learned something during the past few weeks. He had learned to listen when Orv had a new idea. It was true that Orv was only eight, and Wilbur was twelve, but sometimes he startled Will.

"I've got it!" Orv cried. "Yesterday two old tricycles came into the junk yard. Mr. Carmody said they weren't much good. But I noticed that the wheels were okay. A lot of spokes were missing and some were broken, but maybe we could fix them with wire."

"Let's go see Mr. Carmody," Will said.

4

#### **Their First Pocket Money**

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It was as Orv had said. The two tricycles were very old, but the wheels might be fixed. A lot of work had to be done, and it wouldn't be worth Mr. Carmody's time to fix them. Will and Orv told him they needed the wheels for their wagon, and Mr. Carmody smiled and said, "Suppose you fix the wheels. How are you going to attach them to your wagon?"

"We'll have to draw pictures of that first,"

Will said.

"Draw pictures?" Mr. Carmody was a little puzzled.

Then Wilbur explained. He told of how his mother always drew a pattern before she

made herself a dress, and if she drew the pattern right the dress was right. He told about how he and Orv had made their sled. Mr. Carmody listened thoughtfully. And Orv told about how hard it was to pull Ed Sines's wagon with the wooden wheels.

"You're right, boys," he said. "You know, someone didn't just go out and build the first bicycle. Bicycles used to have heavy wooden wheels and thick iron tires. They used to weigh about a hundred pounds. They called 'em 'boneshakers,' and they sure did rattle your bones. You still see a lot of them around."

"Then what happened?" Orv asked.

"Well, some smart Frenchman started studying the bicycle," Mr. Carmody said. "He figured if you could make a lightweight bicycle, it would be easier to work it. You wouldn't get tired so fast. So he sat down and drew a bicycle that would be lighter than the old bonebreaker. He drew a light metal wheel with solid rubber tires cemented to the rims, and wooden spokes. He had someone make it up for him and it weighed half what the old-type bicycle weighed—and it went a lot faster."

"But now bicycles have wire spokes," Will said.

Mr. Carmody nodded. "Some other fellow—an American this time—set down and drew a wheel with wire spokes. That made it lighter and stronger. When he finished his drawing he said, 'That will make the bicycle better and stronger. That bicycle will carry ten times its own weight.' And he had some mechanic make one, and by golly the man was right!"

"His drawing was right, so the bicycle was right," Will said.

Mr. Carmody nodded. "Now, you've seen me on my bicycle. I weigh exactly two hundred pounds and my bicycle weighs just twenty pounds. You see, it carries ten times its weight. You make your wagon right and it'll carry ten times its weight. Now take those two old tricycles home with you and see if you can fix up those wheels. You'd better let me give you some heavy wire and take some axle grease with you, too. Those old wheels will stand a lot of grease."

Orv and Will hurried home, lugging the old tricycles (they had one big wheel in front and two smaller ones in back). They put the

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