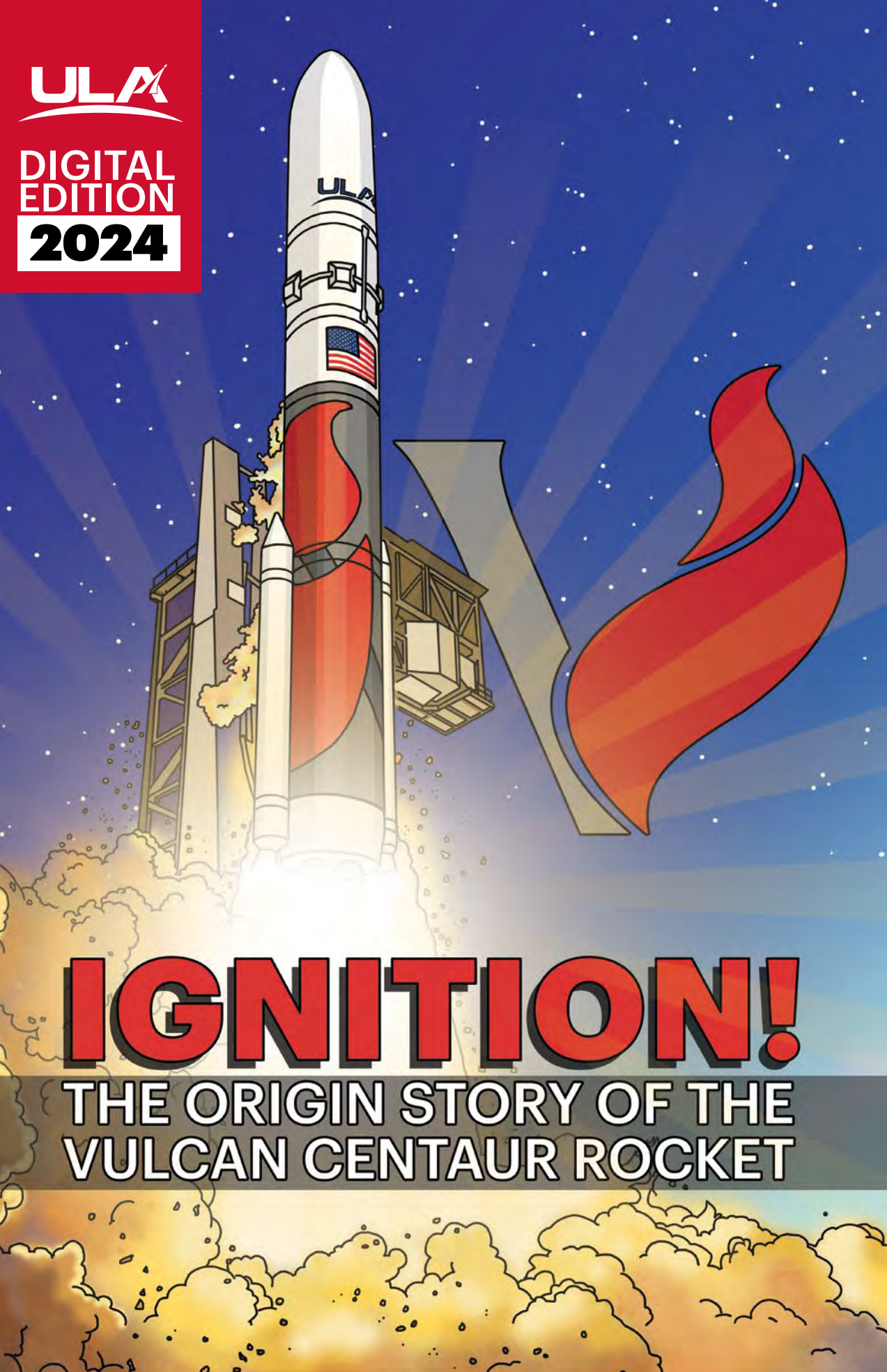
ULA

DIGITAL EDITION 2024



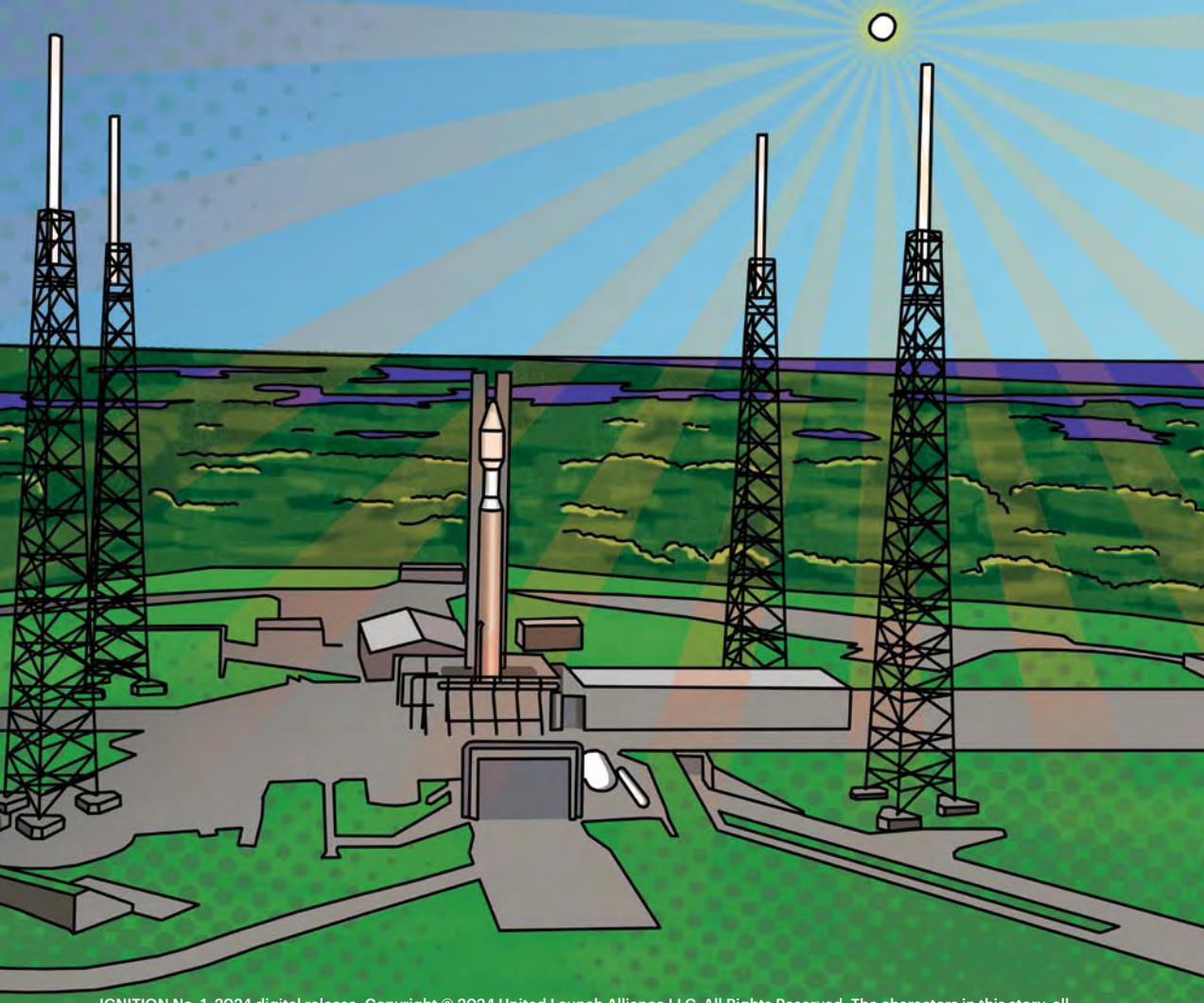
IGNITION!

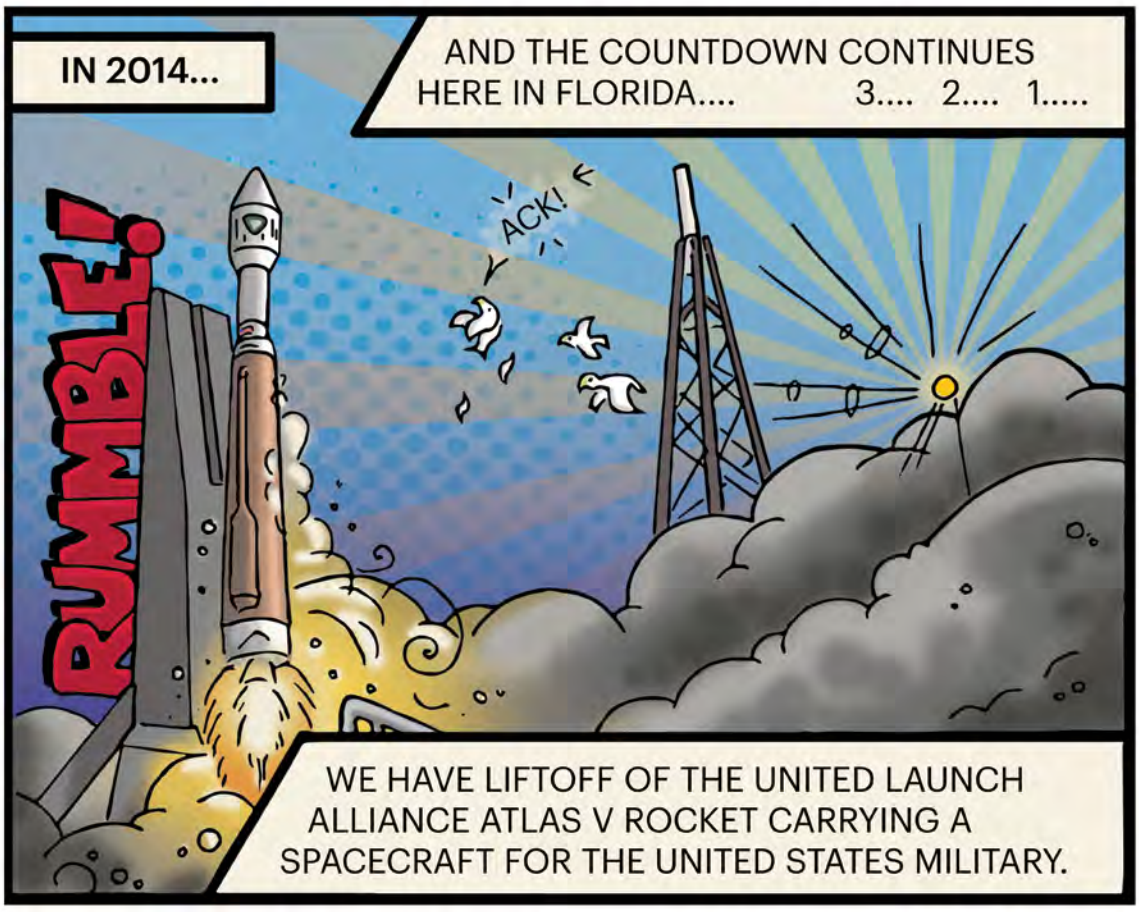
THE ORIGIN STORY OF THE VULCAN CENTAUR ROCKET

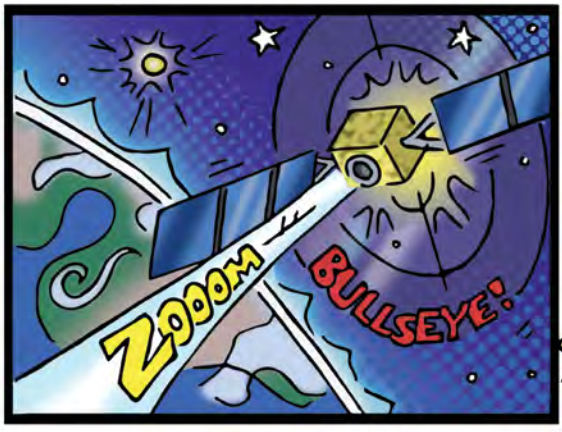
More than 60 years ago, the Atlas and Delta rockets began their tales of success, launching spacecraft on missions to their Earth-bound orbits as well as the vast reaches of space.

United Launch Alliance continued these successful rocket launch programs with the goal to save lives, explore the universe and connect the world.

In August of 2014, Tory Bruno joined the company as the president and CEO, and along with his trusty steed Indigo, began a new chapter of space launch...




IN 2014...
AND THE COUNTDOWN CONTINUES HERE IN FLORIDA.... 3.... 2.... 1.....
RUMBLE!
ACK!
WE HAVE LIFTOFF OF THE UNITED LAUNCH ALLIANCE ATLAS V ROCKET CARRYING A SPACECRAFT FOR THE UNITED STATES MILITARY.


ZOOOM
BULLSEYE!


MISSION SUCCESS! 89!
RING!

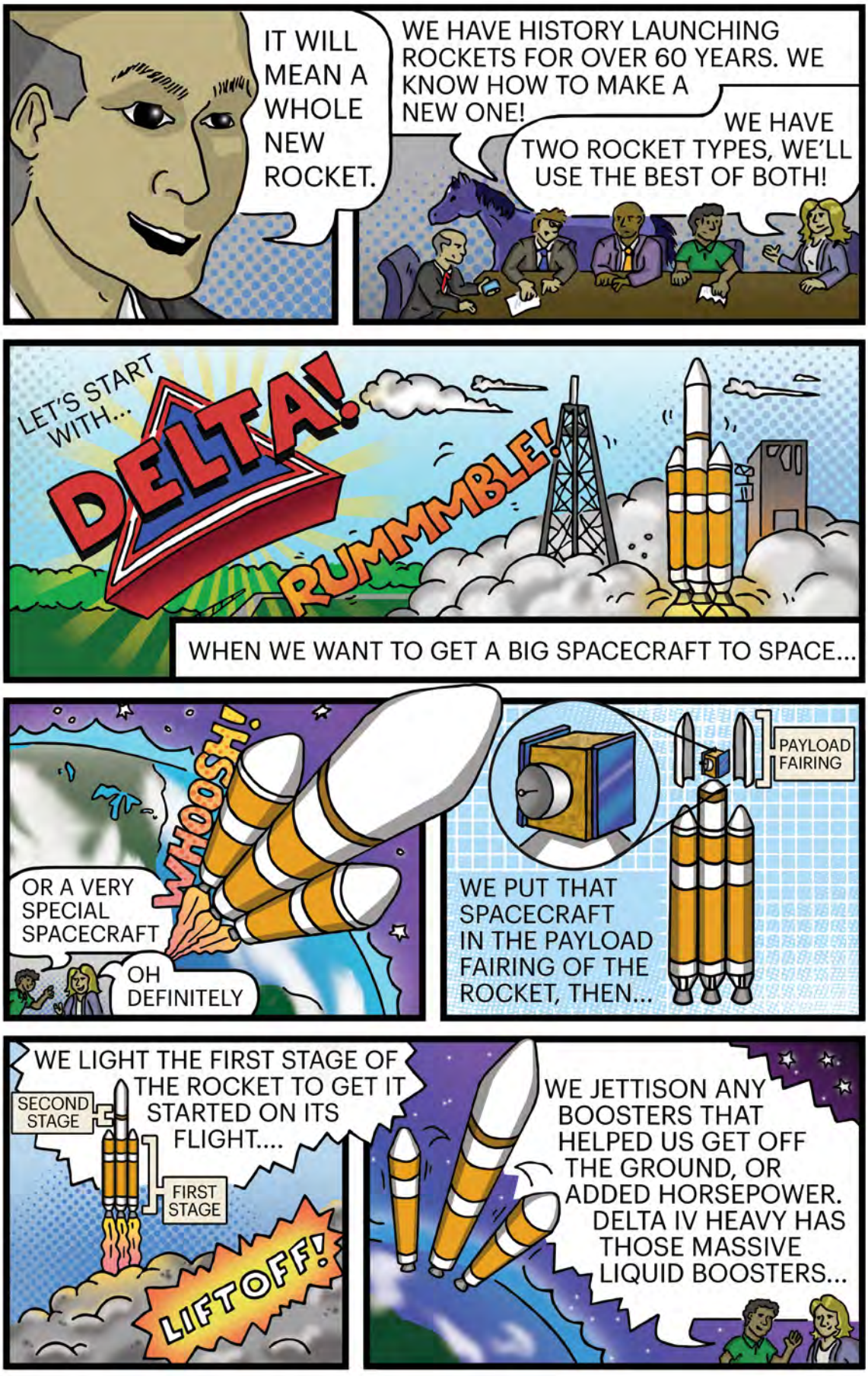

MR. BRUNO, THIS IS THE GENERAL. I WANTED TO SAY CONGRATULATIONS ON YOUR LAUNCH.
SOMEWHERE IN D.C...

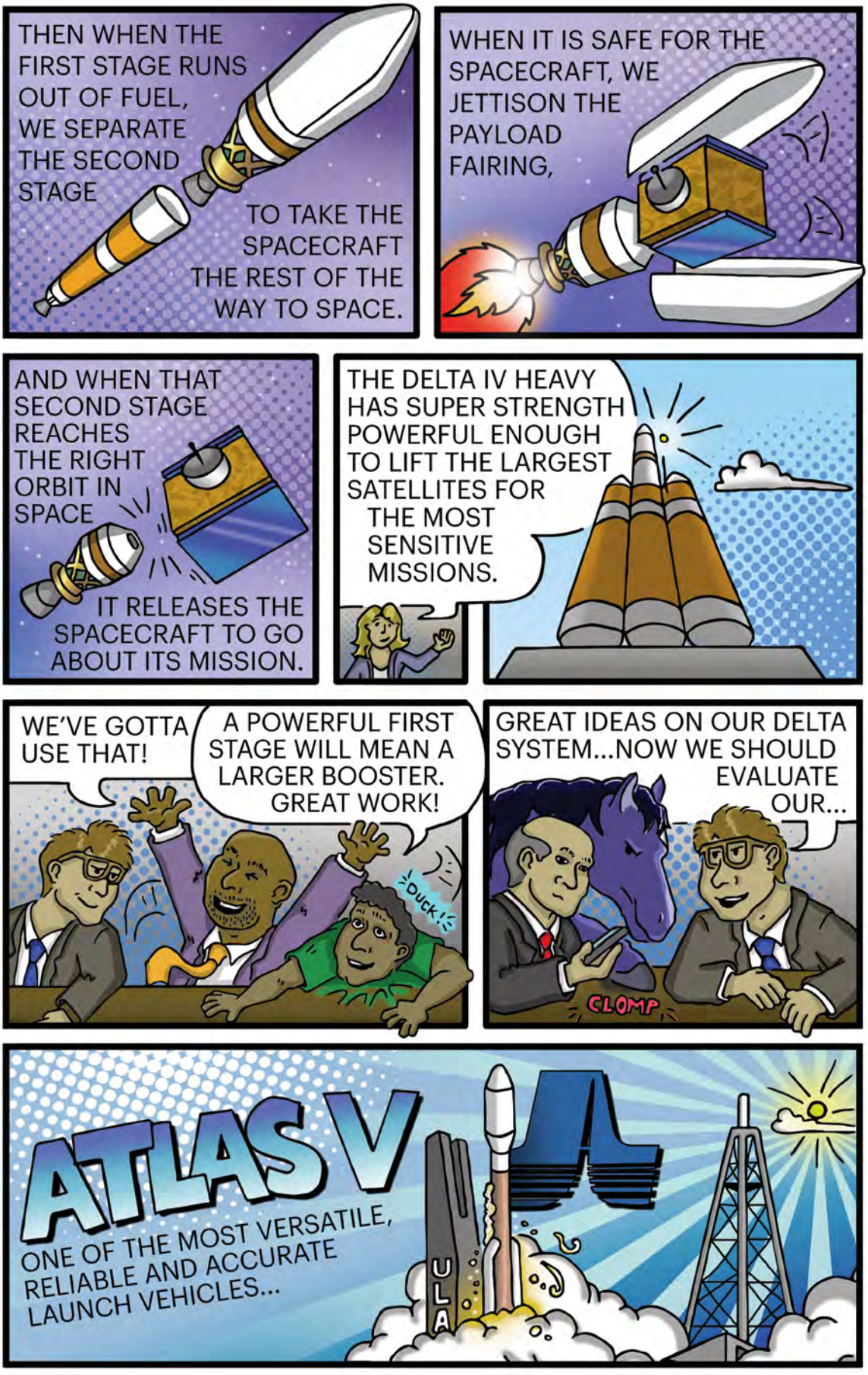

THANK YOU FOR ANOTHER LAUNCH IN SUPPORT OF THE WARFIGHTER. WE NEED SUCCESS TO KEEP OUR COUNTRY'S SUPERIORITY IN SPACE.


AND OUR NATION'S ADVERSARIES ARE ALWAYS TRYING TO BEAT US!
WHAM
GENERAL, ULA WILL ALWAYS SUPPORT OUR NATION!
ULA
PATRIOTIC MUSIC!
INDIGO, WE NEED TO GET HOME AND MEET WITH THE ENGINEERS, OUR COUNTRY NEEDS US.
BOOP!
I'M ALSO GOING TO NEED A NEW HAT.
CLANK
HOW'D HE GET THE HORSE PAST OUR LAUNCH PAD SECURITY TEAM?
WHAT? THE HORSE?
YEAH...
OH, DON'T MESS WITH INDIGO.
HE **IS** SECURITY.


IN DENVER
BOARD ROOM
TEAM, OUR NATION RELIES ON US TO LAUNCH THESE IMPORTANT MISSIONS TO COMPLEX ORBITS IN SPACE TO PROTECT OUR NATION, EXPLORE OUR UNIVERSE AND CONNECT OUR WORLD.
NOW WE FACE NEW CHALLENGES AND WE NEED SOLUTIONS. WHERE ARE WE ON THIS NEW ROCKET?
YES, WELL...UGH...WE HAVE BEEN LOOKING...AT NEW ENGINES, SIR.
CHOMP!
RIP!
GLAD TO HEAR IT. WE HAVE THE BEST PROPULSION PEOPLE IN THE WORLD, HAVE THEM WORK WITH INDIGO, HE'S AN EXPERT IN HORSEPOWER.
CLOP
CLOP
CLOP
GREAT! THAT'S INNOVATION, PICK AN ENGINE AND PROBLEM SOLVED, RIGHT?
OH, NO. FIRST STAGE ENGINES ARE IMPORTANT TO GET THE ROCKET OFF THE GROUND, BUT WE NEED NEW FUEL REQUIREMENTS, SOFTWARE, AND A DIRECT APPROACH TO MAKE SURE IT'S THE RIGHT ROCKET FOR NOT JUST SOME MISSIONS, BUT ALL OF THEM.

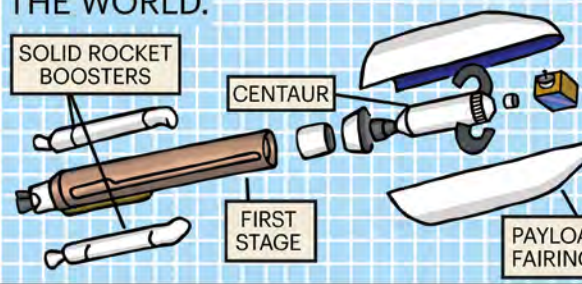

AND OUR CUSTOMERS' MISSIONS ARE BECOMING MORE IMPORTANT AND MORE COMPLEX.
THE ROCKET WILL HELP ASTRONAUTS GO TO SPACE AND EVENTUALLY, MARS AND BEYOND.
IT WILL HELP PROTECT LIVES AS WE STUDY AND PREDICT OUR CHANGING WORLD...
WHILE STILL EXPLORING THE FARTHEST REACHES OF OUR UNIVERSE...
IT WILL CONNECT OUR WORLD THROUGH EVOLVING TECHNOLOGY...
AND STILL PROTECT OUR TROOPS AROUND THE WORLD.
ALL OF THESE MISSIONS ARE HIGHLY SPECIALIZED.


IT WILL MEAN A WHOLE NEW ROCKET.
WE HAVE HISTORY LAUNCHING ROCKETS FOR OVER 60 YEARS. WE KNOW HOW TO MAKE A NEW ONE!
WE HAVE TWO ROCKET TYPES, WE'LL USE THE BEST OF BOTH!
LET'S START WITH...
DELTA!
RUMMMBLE!
WHEN WE WANT TO GET A BIG SPACECRAFT TO SPACE...
WHOOSH!
OR A VERY SPECIAL SPACECRAFT
OH DEFINITELY
PAYLOAD FAIRING
WE PUT THAT SPACECRAFT IN THE PAYLOAD FAIRING OF THE ROCKET, THEN...
WE LIGHT THE FIRST STAGE OF THE ROCKET TO GET IT STARTED ON ITS FLIGHT....
SECOND STAGE
FIRST STAGE
LIFTOFF!
WE JETTISON ANY BOOSTERS THAT HELPED US GET OFF THE GROUND, OR ADDED HORSEPOWER. DELTA IV HEAVY HAS THOSE MASSIVE LIQUID BOOSTERS...


THEN WHEN THE FIRST STAGE RUNS OUT OF FUEL, WE SEPARATE THE SECOND STAGE
TO TAKE THE SPACECRAFT THE REST OF THE WAY TO SPACE.
WHEN IT IS SAFE FOR THE SPACECRAFT, WE JETTISON THE PAYLOAD FAIRING,
AND WHEN THAT SECOND STAGE REACHES THE RIGHT ORBIT IN SPACE
IT RELEASES THE SPACECRAFT TO GO ABOUT ITS MISSION.
THE DELTA IV HEAVY HAS SUPER STRENGTH POWERFUL ENOUGH TO LIFT THE LARGEST SATELLITES FOR THE MOST SENSITIVE MISSIONS.
WE'VE GOTTA USE THAT!
A POWERFUL FIRST STAGE WILL MEAN A LARGER BOOSTER. GREAT WORK!
DUCK!
GREAT IDEAS ON OUR DELTA SYSTEM...NOW WE SHOULD EVALUATE OUR...
CLOMP
ATLAS V
ONE OF THE MOST VERSATILE, RELIABLE AND ACCURATE LAUNCH VEHICLES...
ULA

WITH CENTAUR, IT HAS LAUNCHED SPACECRAFT TO STUDY EVERY PLANET IN THE SOLAR SYSTEM,

AND LAUNCHED NATIONAL SECURITY SATELLITES WHICH PROTECT OUR NATION AND OUR TROOPS AROUND THE WORLD.

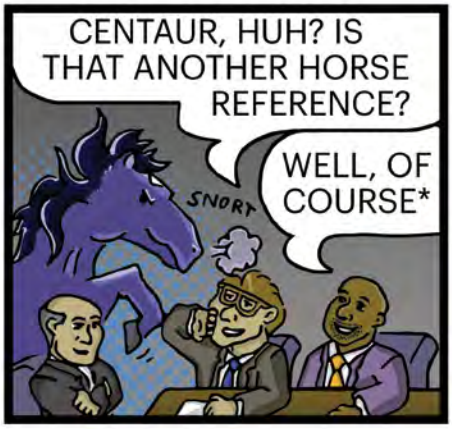


TO ACCOMPLISH THIS, ATLAS USES A NUMBER OF SOLID ROCKET BOOSTERS

TO REACH DIFFERENT LEVELS OF HORSEPOWER FOR DIFFERENT SPACECRAFT

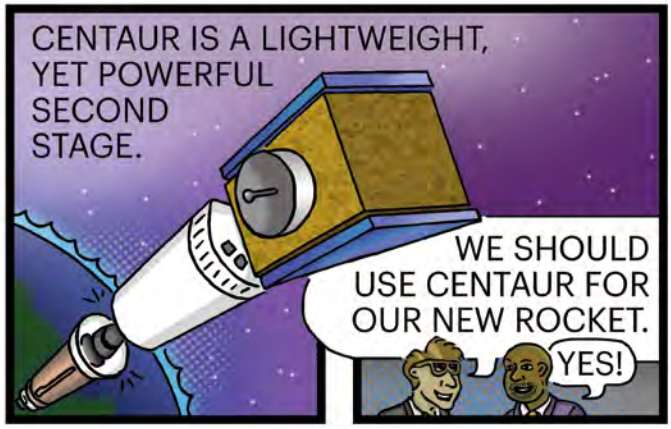
AFTER THE PAYLOAD FAIRING SEPARATES, THE SECOND STAGE, CALLED CENTAUR, SEPARATES FROM THE FIRST STAGE AND THE HIGHLY-ACCURATE AVIONICS COMPUTERS TELL CENTAUR PRECISELY WHERE IN SPACE TO DELIVER THE CARGO.

CENTAUR, HUH? IS THAT ANOTHER HORSE REFERENCE?



WELL, OF COURSE*

CENTAUR IS A LIGHTWEIGHT, YET POWERFUL SECOND STAGE.



WE SHOULD USE CENTAUR FOR OUR NEW ROCKET.

YES!

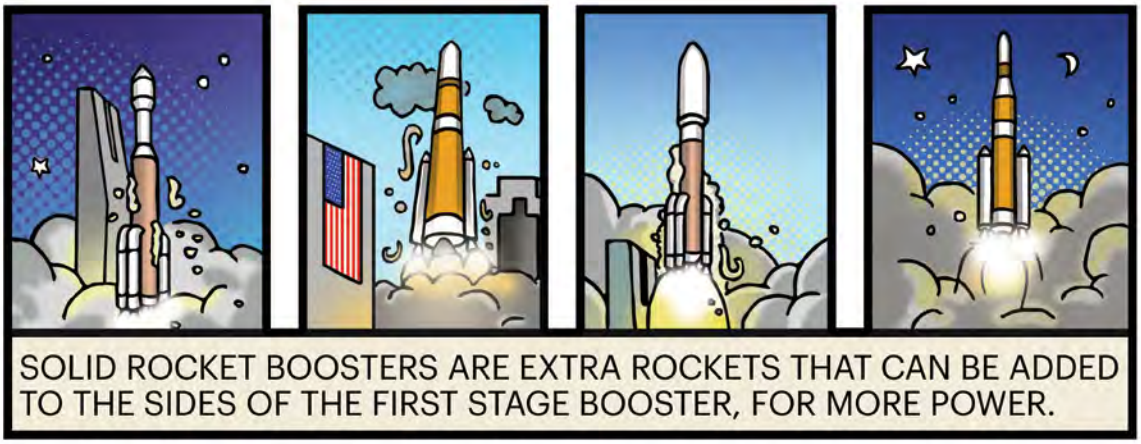
GREAT, WE CAN DEVELOP A LARGER FIRST STAGE, A NEW CENTAUR-DERIVED SECOND STAGE AND POP IT ALL IN OVER THESE NEW ENGINES!

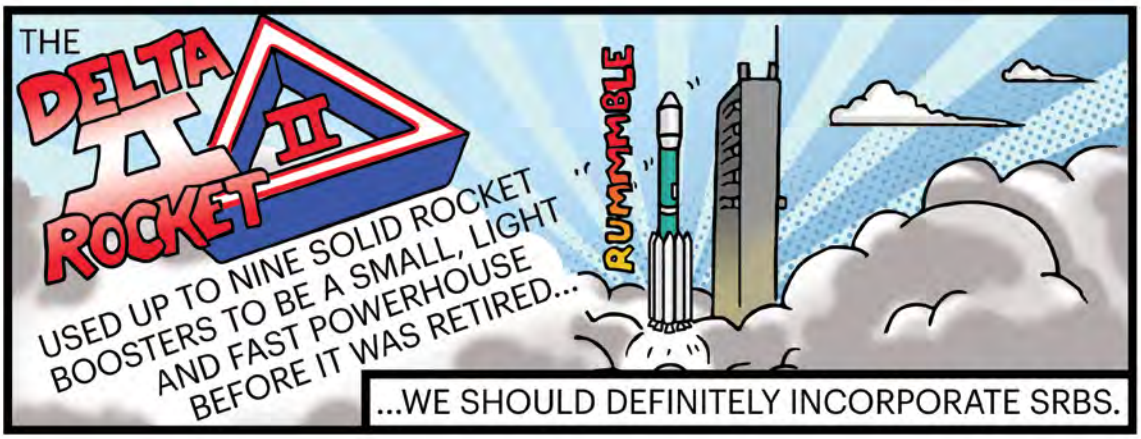
WELL...

SO, NOW WE'RE DONE?

...IT WOULD BE GREAT TO USE EXTRA BOOSTERS TO ADD MORE POWER. REMEMBER, WE WANT TO SUPPORT **EVERY** MISSION...

* A CENTAUR IS A MYTHOLOGICAL CREATURE WITH THE HEAD, CHEST AND ARMS OF A HUMAN COMBINED WITH THE BODY OF A HORSE. A CENTAUR IS ALSO INDIGO'S FAVORITE SECOND STAGE.

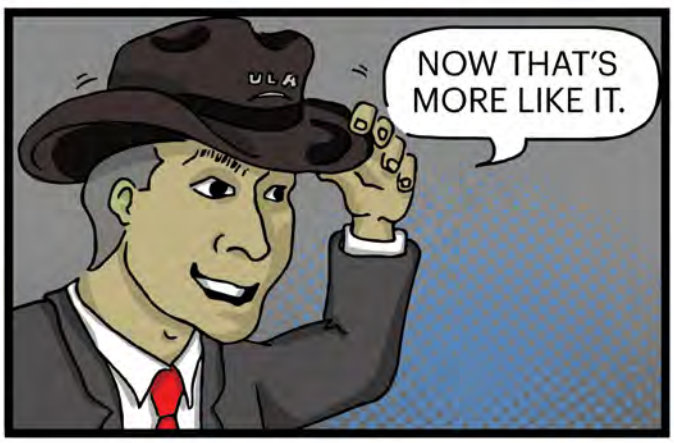

SOLID ROCKET BOOSTERS ARE EXTRA ROCKETS THAT CAN BE ADDED TO THE SIDES OF THE FIRST STAGE BOOSTER, FOR MORE POWER.


THE
DELTA II
ROCKET
USED UP TO NINE SOLID ROCKET BOOSTERS TO BE A SMALL, LIGHT AND FAST POWERHOUSE BEFORE IT WAS RETIRED...
RUMMMBLE
...WE SHOULD DEFINITELY INCORPORATE SRBS.


THE CONCEPT IS IN PLACE BUT...


WE STILL HAVE TO DO THE WORK: DESIGN, TEST, PREPARE THE FACTORY AND LAUNCH SITES, BUILD IT, AND... WE NEED A NAME. WE HAVE A LOT TO DO!


KNOCK KNOCK
SIR? SORRY TO INTERRUPT. WE FOUND THAT NEW HARD HAT YOU ASKED FOR.

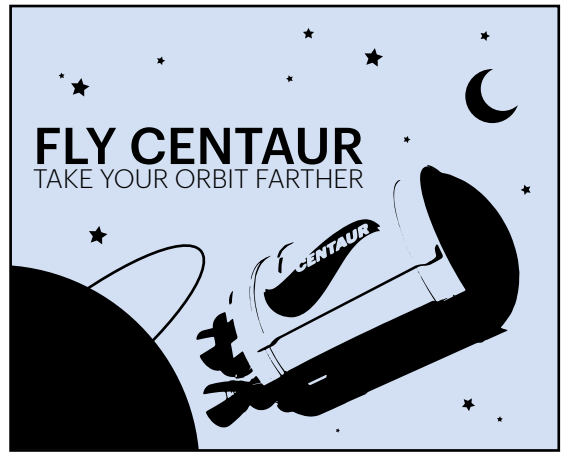

ULA
NOW THAT'S MORE LIKE IT.

PRECISION TRAJECTORY
Tools for the Space Cowboy

Specials on silver-inlaid, rowelled, attitude control and thrust vectoring gimballed actuators

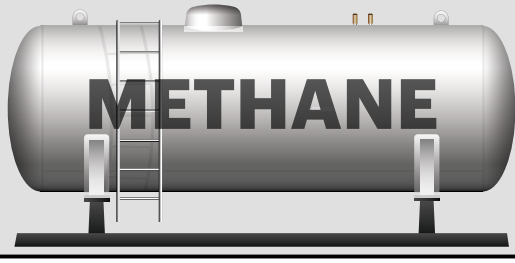
EVERYTHING THE SPACE COWBOY NEEDS TO TRAVEL THE UNIVERSE

FLY CENTAUR
TAKE YOUR ORBIT FARTHER



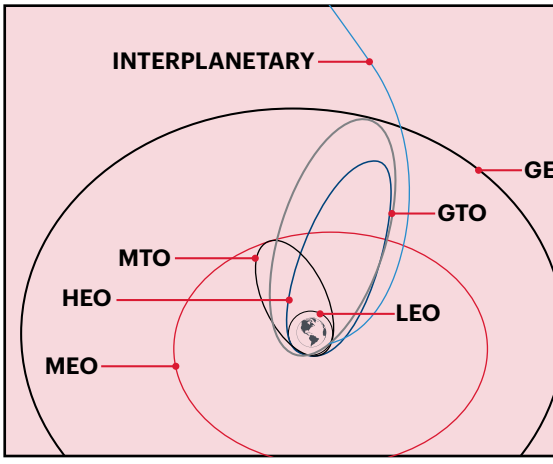
THE NEXT MISSION!
Check out our next launch

HAZ GAS?
YES IT DOES!
Vulcan Centaur's main booster is powered by methane!



JOIN THE TEAM

Space is available on the top U.S. space team. Help us build & launch Vulcan!

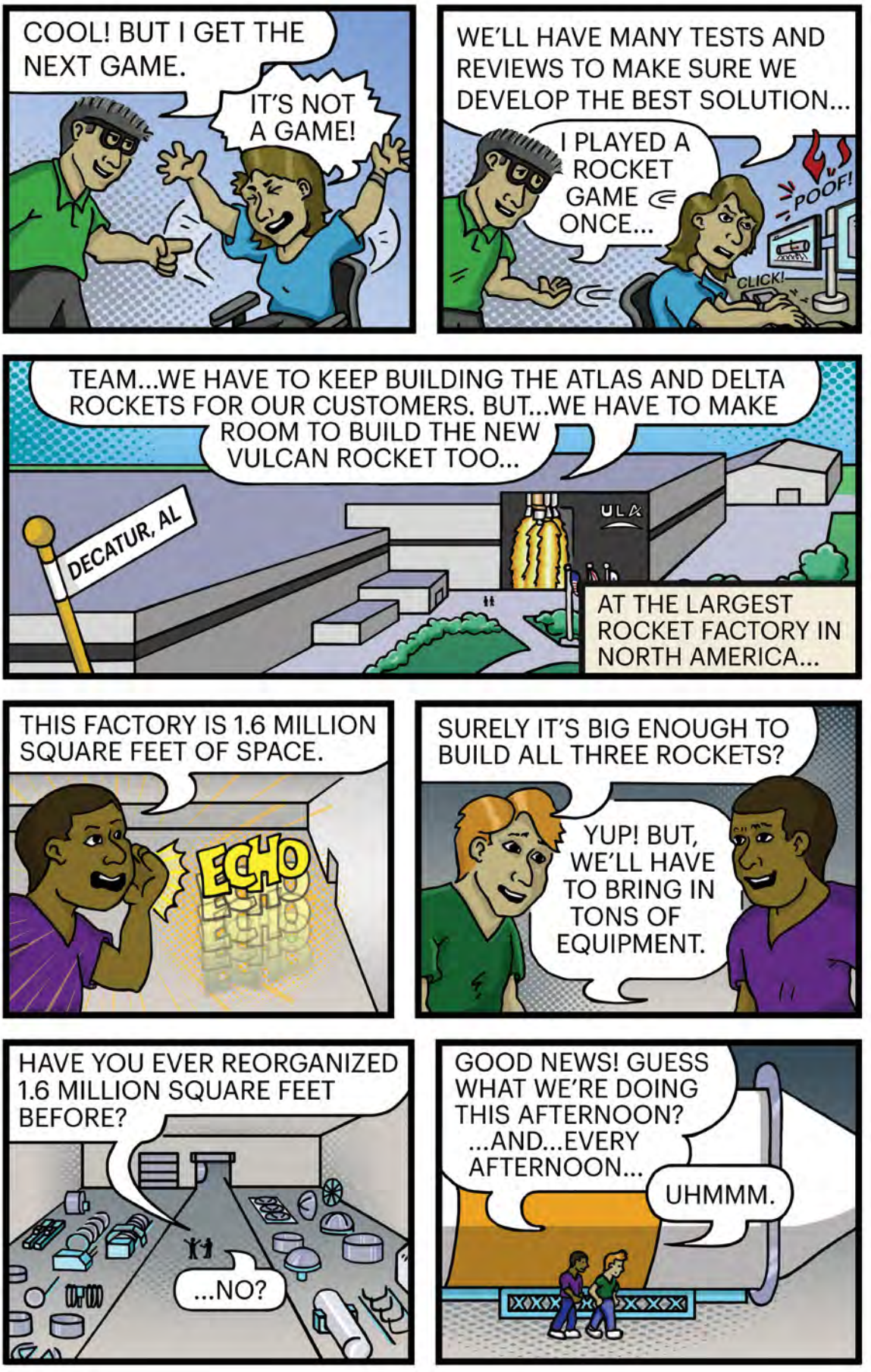


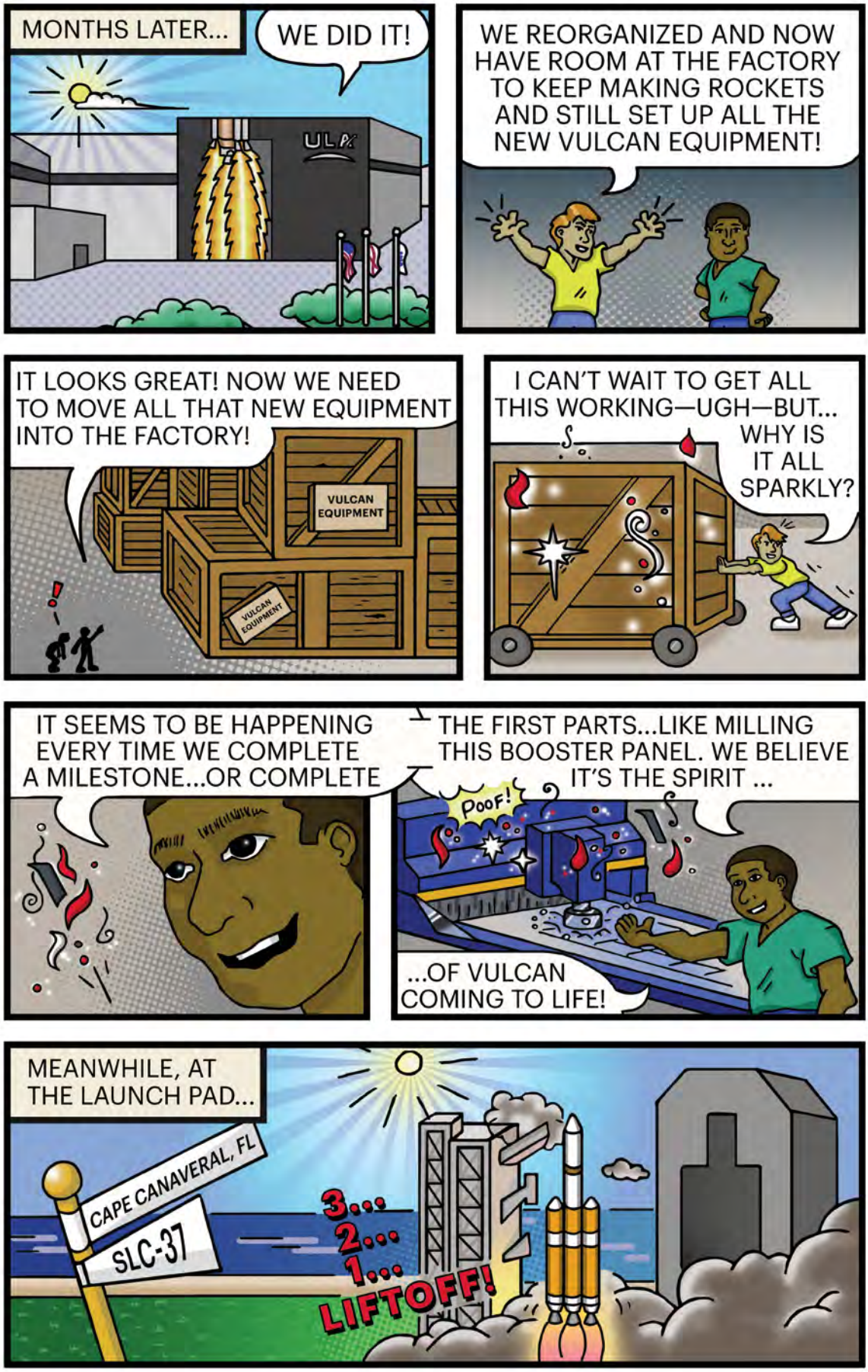
TRAVEL ABROAD!

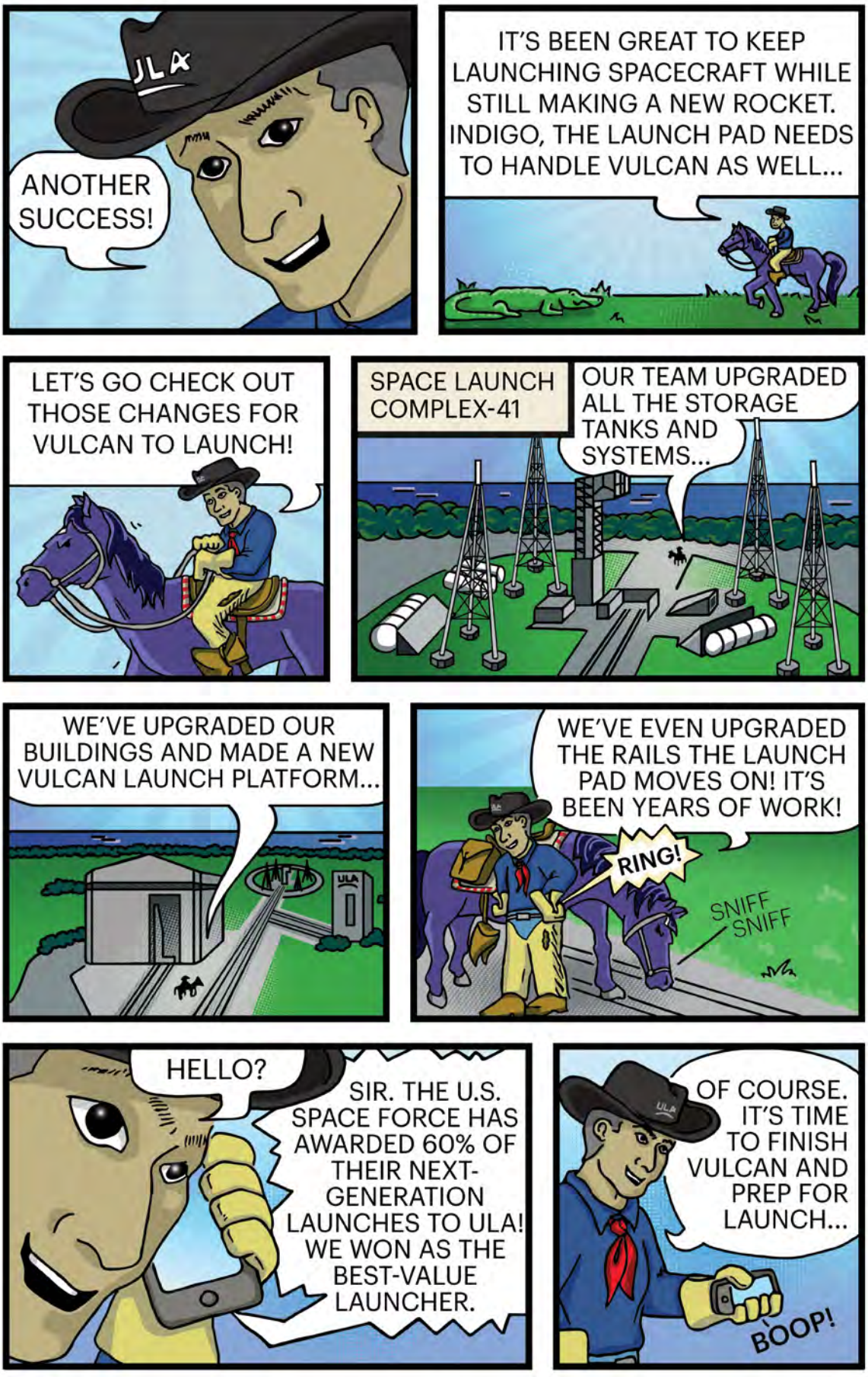
With so many places in the galaxy to travel, why stop at LEO? Check with your Trajectory Agent today for flights departing from a launch complex near you!

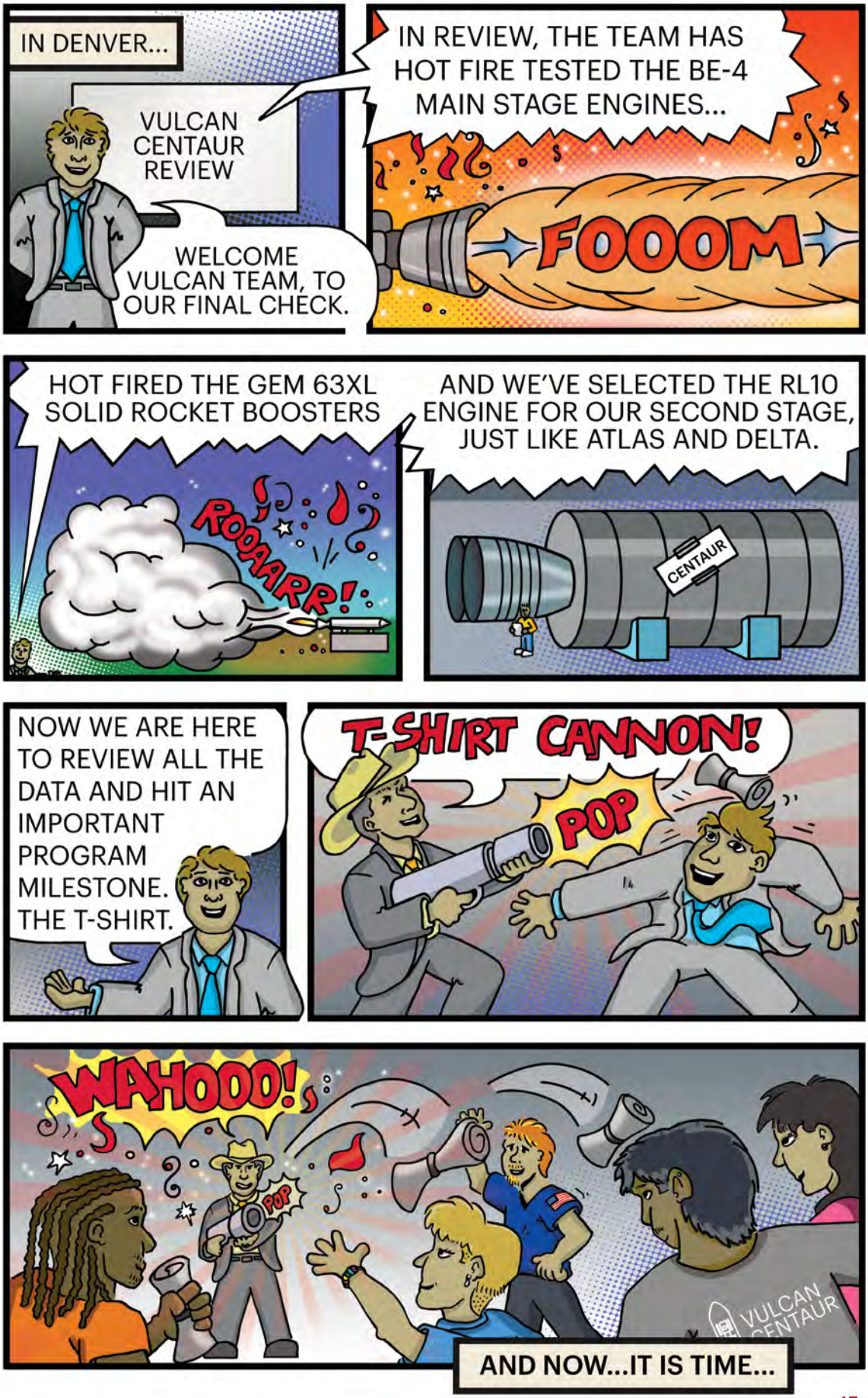

AS THE COMPANY SETS FORTH DESIGNING A NEW RIDE TO SPACE, TORY AND INDIGO SET OFF ON A NEW ADVENTURE...
COLORADO
INDIGO...
IT'S TIME TO LET EVERYONE HELP WITH THIS NEW ROCKET...
IT'S TIME TO LET OUR FANS...
VOTE
TO NAME THE ROCKET!
CALL MY COMMUNICATIONS TEAM...
MUNCH MUNCH MUNCH
FINE... I'LL DO IT.
BOOP BOOP BEEP
SIX WEEKS LATER, AT SPACE SYMPOSIUM...
HELLO NATION. WE GAVE THREE NAMES AND YOU VOTED TO NAME OUR NEW ROCKET.
I'M HERE TO ANNOUNCE THE WINNER. WITH OVER ONE MILLION VOTES, OUR NEW ROCKET IS NOW CALLED...

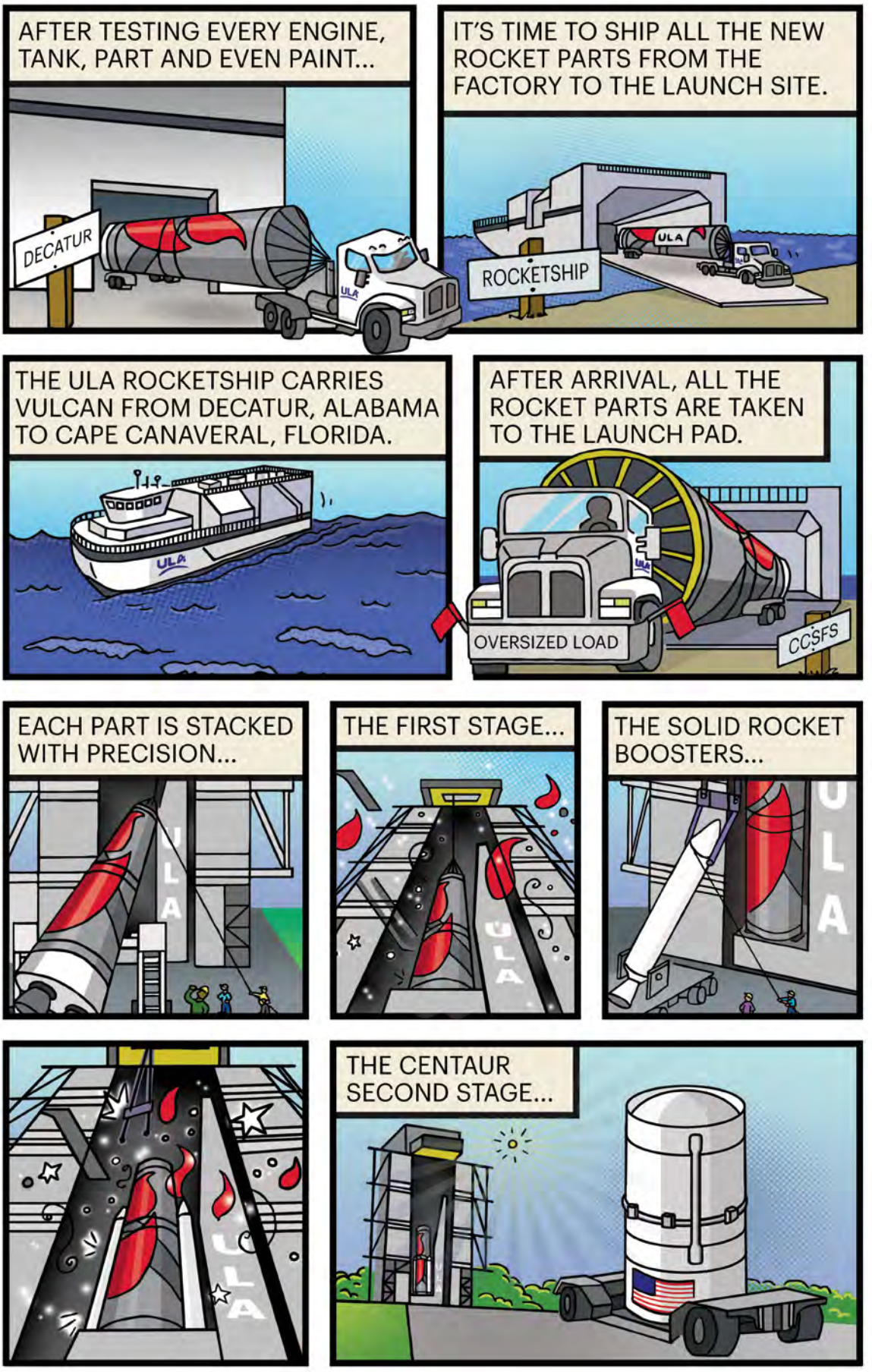

VULCAN!
HERE, HAVE A HAT!
TIP!
TOPPLE!
LOOK OUT! INCOMING!
BAM
CRASH
NUDGE
UGH
YES?
NO, WE CHOSE THE ENGINE YOU LIKED. THIS WAS A VOTE.
WHINE
MEANWHILE AT HEADQUARTERS...
HEY!
HIYA!
OH! IS THAT A 3D VIDEO GAME?
HA. NO. I'M DESIGNING THE VULCAN ROCKET...WE HAVE ALL TYPES OF ENGINEERS WORKING ON IT.
WE HAVE TO COMBINE OUR ATLAS AND DELTA STRUCTURES TO DESIGN THE FINAL ROCKET...
BOOSTER
THEN AT THE SYSTEMS LEVEL, WE WORK WITH TEAMS OF ENGINEERS TO TEST EVERY PART AND LINE OF CODE TO MAKE SURE IT ALL WORKS TOGETHER... IT REALLY IS ROCKET SCIENCE. WE HAVE TO DO IT RIGHT...

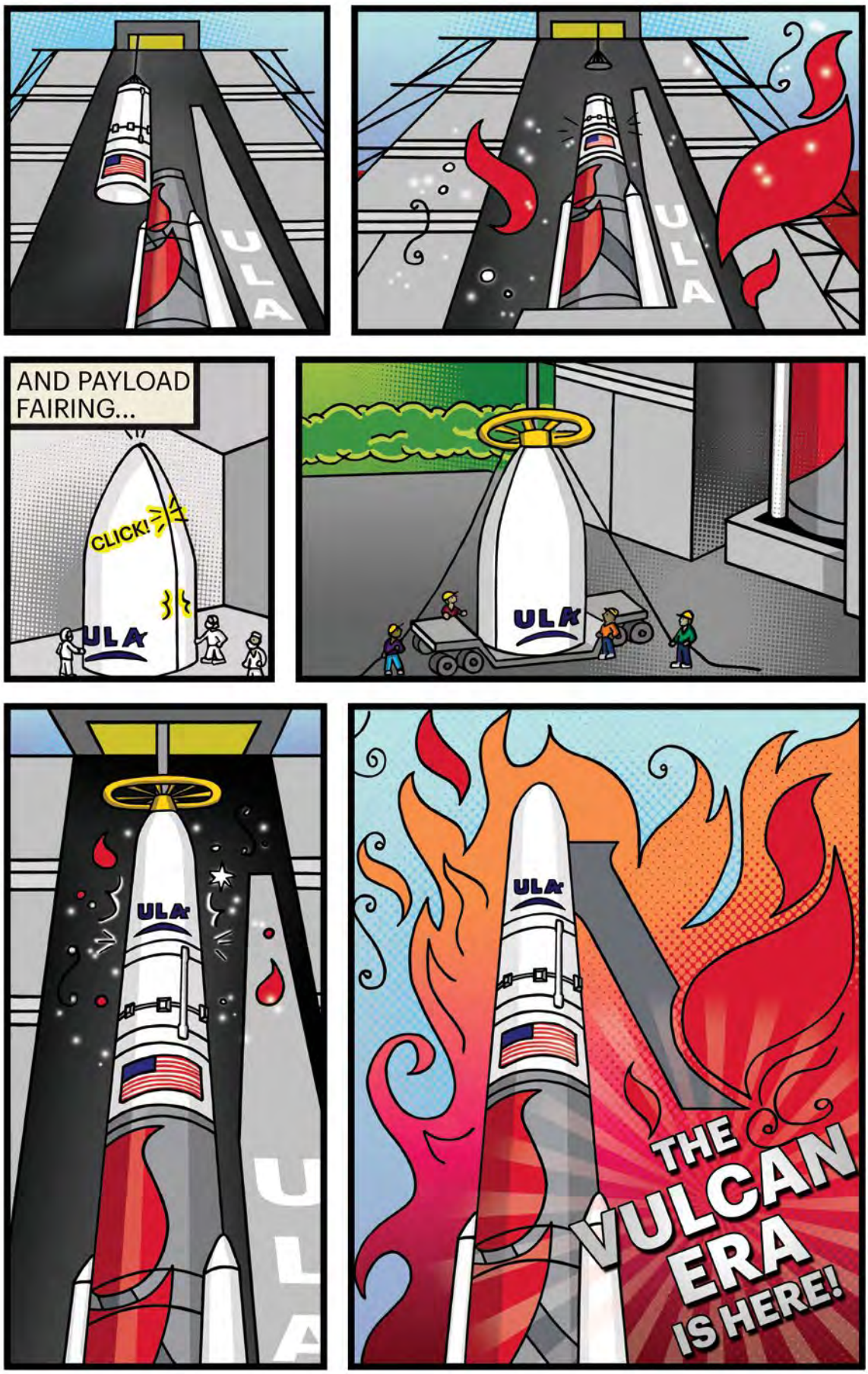

COOL! BUT I GET THE NEXT GAME.
IT'S NOT A GAME!
WE'LL HAVE MANY TESTS AND REVIEWS TO MAKE SURE WE DEVELOP THE BEST SOLUTION...
I PLAYED A ROCKET GAME ONCE...
POOF!
CLICK!
TEAM...WE HAVE TO KEEP BUILDING THE ATLAS AND DELTA ROCKETS FOR OUR CUSTOMERS. BUT...WE HAVE TO MAKE ROOM TO BUILD THE NEW VULCAN ROCKET TOO...
DECATUR, AL
ULA
AT THE LARGEST ROCKET FACTORY IN NORTH AMERICA...
THIS FACTORY IS 1.6 MILLION SQUARE FEET OF SPACE.
ECHO
SURELY IT'S BIG ENOUGH TO BUILD ALL THREE ROCKETS?
YUP! BUT, WE'LL HAVE TO BRING IN TONS OF EQUIPMENT.
HAVE YOU EVER REORGANIZED 1.6 MILLION SQUARE FEET BEFORE?
...NO?
GOOD NEWS! GUESS WHAT WE'RE DOING THIS AFTERNOON? ...AND...EVERY AFTERNOON...
UHMMM.

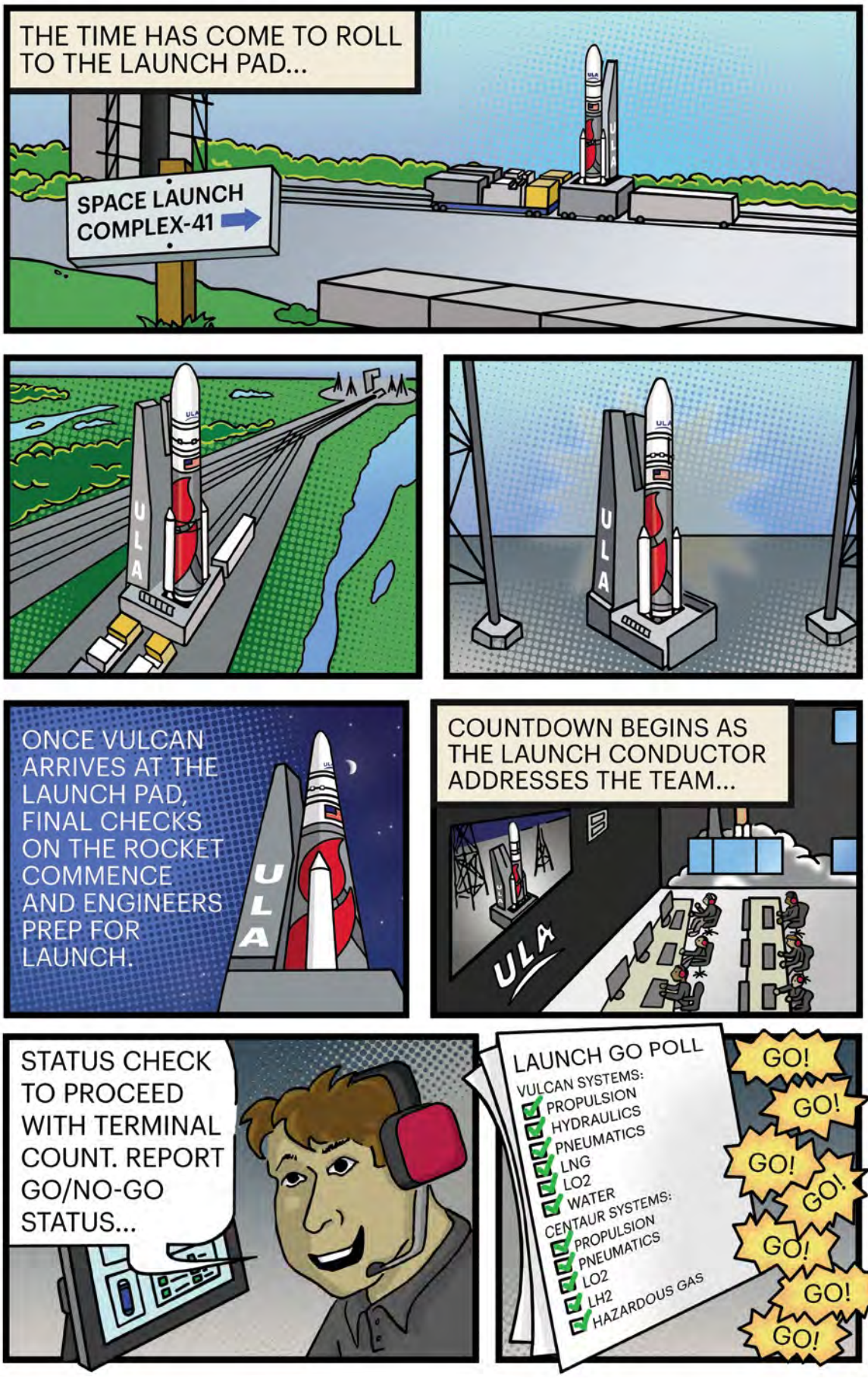

MONTHS LATER...
WE DID IT!
ULA
WE REORGANIZED AND NOW HAVE ROOM AT THE FACTORY TO KEEP MAKING ROCKETS AND STILL SET UP ALL THE NEW VULCAN EQUIPMENT!
IT LOOKS GREAT! NOW WE NEED TO MOVE ALL THAT NEW EQUIPMENT INTO THE FACTORY!
VULCAN EQUIPMENT
VULCAN EQUIPMENT
I CAN'T WAIT TO GET ALL THIS WORKING—UGH—BUT... WHY IS IT ALL SPARKLY?
IT SEEMS TO BE HAPPENING EVERY TIME WE COMPLETE A MILESTONE...OR COMPLETE
THE FIRST PARTS...LIKE MILLING THIS BOOSTER PANEL. WE BELIEVE IT'S THE SPIRIT ...
POOF!
...OF VULCAN COMING TO LIFE!
MEANWHILE, AT THE LAUNCH PAD...
CAPE CANAVERAL, FL
SLC-37
3...
2...
1...
LIFTOFF!

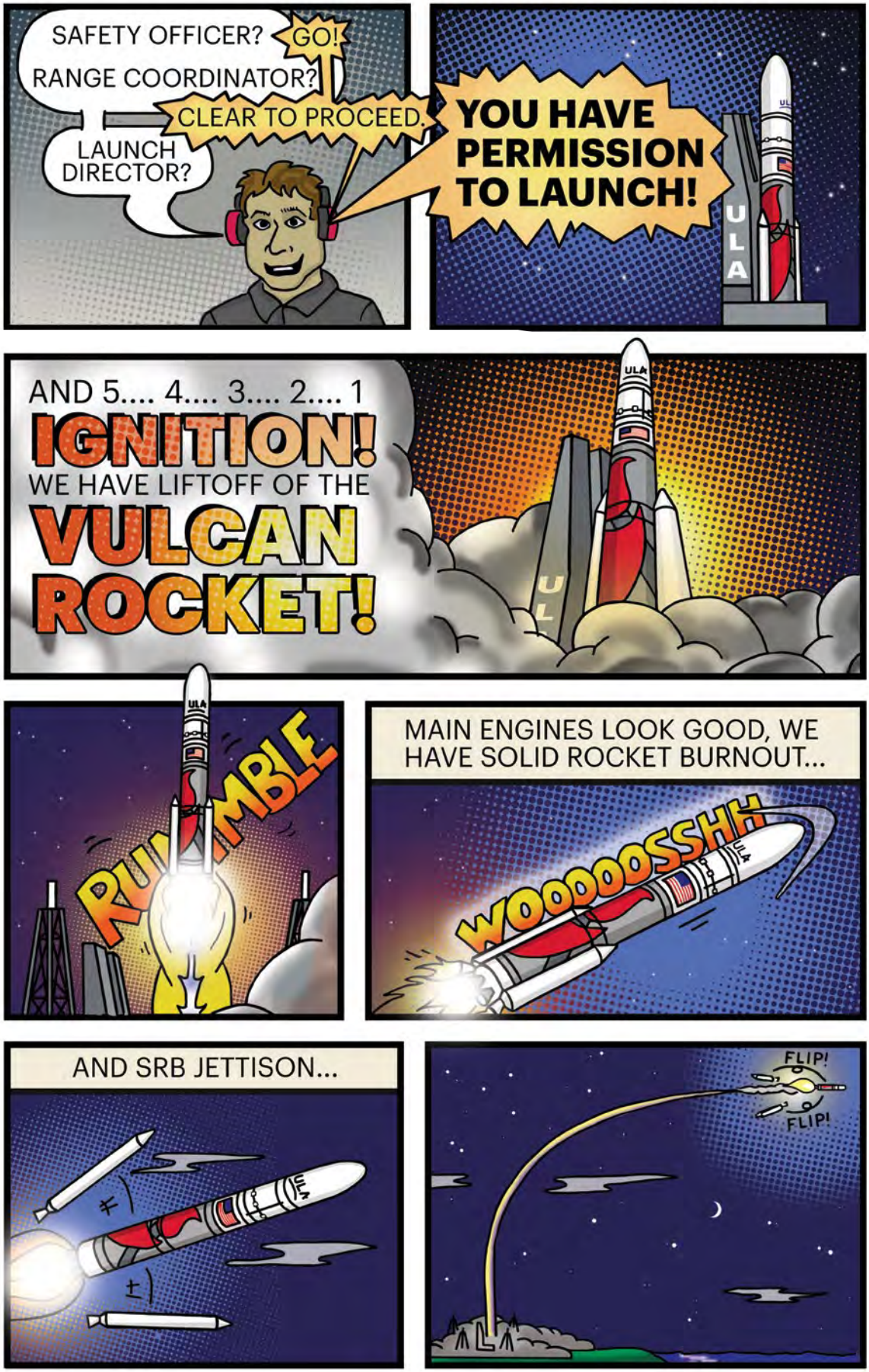

ULA
ANOTHER SUCCESS!
IT'S BEEN GREAT TO KEEP LAUNCHING SPACECRAFT WHILE STILL MAKING A NEW ROCKET. INDIGO, THE LAUNCH PAD NEEDS TO HANDLE VULCAN AS WELL...
LET'S GO CHECK OUT THOSE CHANGES FOR VULCAN TO LAUNCH!
SPACE LAUNCH COMPLEX-41
OUR TEAM UPGRADED ALL THE STORAGE TANKS AND SYSTEMS...
WE'VE UPGRADED OUR BUILDINGS AND MADE A NEW VULCAN LAUNCH PLATFORM...
WE'VE EVEN UPGRADED THE RAILS THE LAUNCH PAD MOVES ON! IT'S BEEN YEARS OF WORK!
RING!
SNIFF SNIFF
HELLO?
SIR. THE U.S. SPACE FORCE HAS AWARDED 60% OF THEIR NEXT-GENERATION LAUNCHES TO ULA! WE WON AS THE BEST-VALUE LAUNCHER.
OF COURSE. IT'S TIME TO FINISH VULCAN AND PREP FOR LAUNCH...
BOOP!

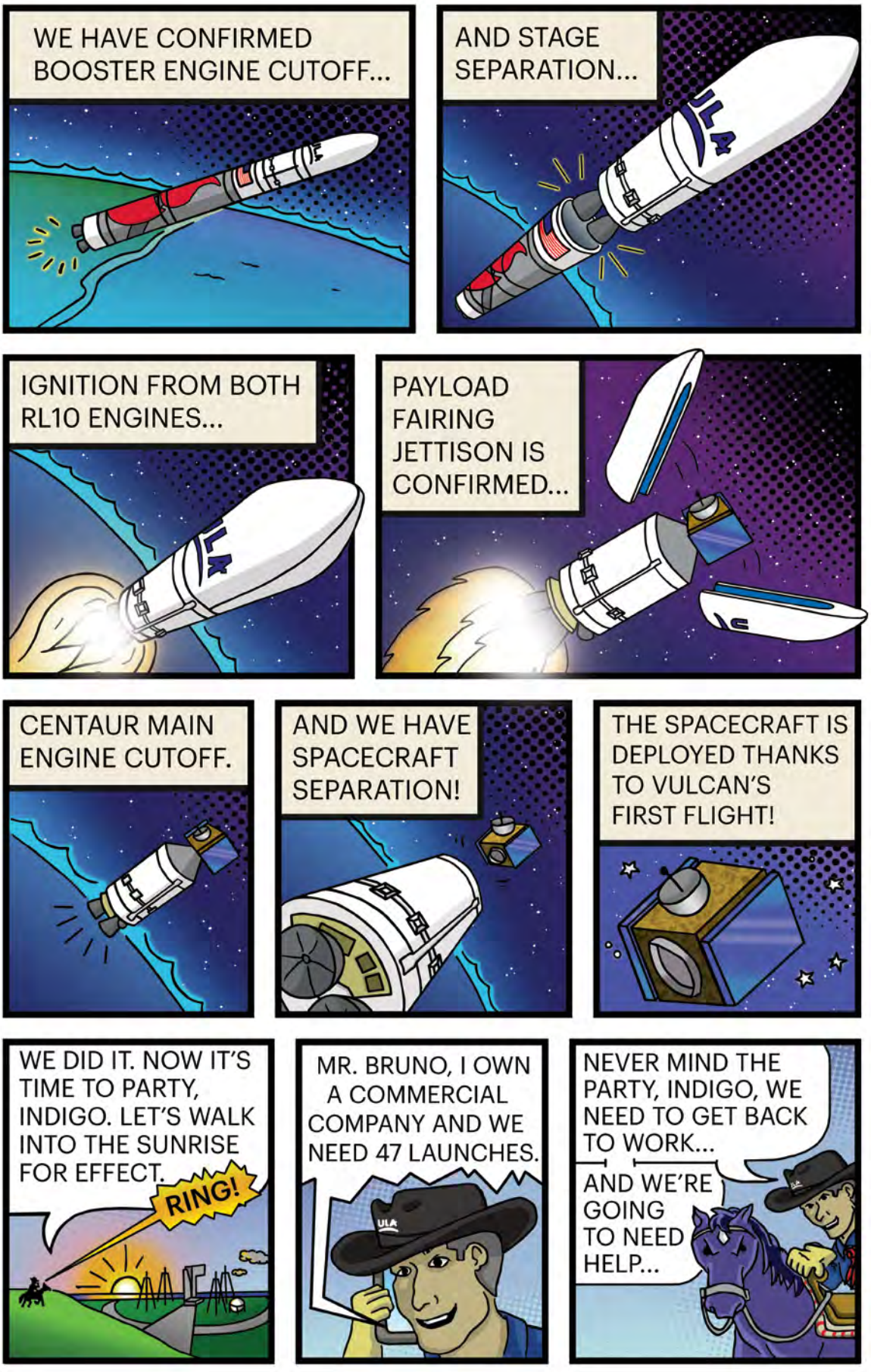

IN DENVER...
VULCAN CENTAUR REVIEW
WELCOME VULCAN TEAM, TO OUR FINAL CHECK.
IN REVIEW, THE TEAM HAS HOT FIRE TESTED THE BE-4 MAIN STAGE ENGINES...
FOOOM
HOT FIRED THE GEM 63XL SOLID ROCKET BOOSTERS
ROOAARR!
AND WE'VE SELECTED THE RL10 ENGINE FOR OUR SECOND STAGE, JUST LIKE ATLAS AND DELTA.
CENTAUR
NOW WE ARE HERE TO REVIEW ALL THE DATA AND HIT AN IMPORTANT PROGRAM MILESTONE. THE T-SHIRT.
T-SHIRT CANNON!
POP
WAHOOO!
POP
VULCAN CENTAUR
AND NOW...IT IS TIME...


AFTER TESTING EVERY ENGINE, TANK, PART AND EVEN PAINT...
DECATUR
ULA
IT'S TIME TO SHIP ALL THE NEW ROCKET PARTS FROM THE FACTORY TO THE LAUNCH SITE.
ROCKETSHIP
ULA
THE ULA ROCKETSHIP CARRIES VULCAN FROM DECATUR, ALABAMA TO CAPE CANAVERAL, FLORIDA.
ULA
AFTER ARRIVAL, ALL THE ROCKET PARTS ARE TAKEN TO THE LAUNCH PAD.
OVERSIZED LOAD
CCSFS
EACH PART IS STACKED WITH PRECISION...
ULA
THE FIRST STAGE...
ULA
THE SOLID ROCKET BOOSTERS...
ULA
ULA
THE CENTAUR SECOND STAGE...


ULA
ULA
AND PAYLOAD FAIRING...
CLICK!
ULA
ULA
ULA
ULA
THE VULCAN ERA IS HERE!


THE TIME HAS COME TO ROLL TO THE LAUNCH PAD...
SPACE LAUNCH COMPLEX-41
ULA
ONCE VULCAN ARRIVES AT THE LAUNCH PAD, FINAL CHECKS ON THE ROCKET COMMENCE AND ENGINEERS PREP FOR LAUNCH.
COUNTDOWN BEGINS AS THE LAUNCH CONDUCTOR ADDRESSES THE TEAM...
STATUS CHECK TO PROCEED WITH TERMINAL COUNT. REPORT GO/NO-GO STATUS...
LAUNCH GO POLL
VULCAN SYSTEMS:
PROPULSION
HYDRAULICS
PNEUMATICS
LNG
LO2
WATER
CENTAUR SYSTEMS:
PROPULSION
PNEUMATICS
LO2
LH2
HAZARDOUS GAS
GO!


SAFETY OFFICER?
GO!
RANGE COORDINATOR?
CLEAR TO PROCEED.
LAUNCH DIRECTOR?
YOU HAVE PERMISSION TO LAUNCH!
ULA
AND 5.... 4.... 3.... 2.... 1
IGNITION!
WE HAVE LIFTOFF OF THE
VULCAN ROCKET!
RUMBLE
MAIN ENGINES LOOK GOOD, WE HAVE SOLID ROCKET BURNOUT...
WOOOOOSSHK
AND SRB JETTISON...
FLIP!
FLIP!


WE HAVE CONFIRMED BOOSTER ENGINE CUTOFF...
AND STAGE SEPARATION...
IGNITION FROM BOTH RL10 ENGINES...
PAYLOAD FAIRING JETTISON IS CONFIRMED...
CENTAUR MAIN ENGINE CUTOFF.
AND WE HAVE SPACECRAFT SEPARATION!
THE SPACECRAFT IS DEPLOYED THANKS TO VULCAN'S FIRST FLIGHT!
WE DID IT. NOW IT'S TIME TO PARTY, INDIGO. LET'S WALK INTO THE SUNRISE FOR EFFECT.
RING!
MR. BRUNO, I OWN A COMMERCIAL COMPANY AND WE NEED 47 LAUNCHES.
NEVER MIND THE PARTY, INDIGO, WE NEED TO GET BACK TO WORK...
AND WE'RE GOING TO NEED HELP...

To our team, our customers, our friends and future rocket scientists—thank you!

We couldn't have made it here without you. From design and assembly on the manufacturing floor to launching into orbit and following along online—in whatever way you've been involved in this journey, big or small, you are a part of the Vulcan origin story!

American ingenuity and an unrivaled commitment to mission success have long been at the heart of this organization. ULA's heritage has been the backbone of American space launch for decades, enabling our nation to protect and improve life on Earth and journey to deep space to expand our knowledge of the universe. Vulcan leverages what we've learned from more than 120 combined years of launch experience with Atlas and Delta—knowledge we continue to build on every day—to usher in a new era of space launch and further advance America's superiority in space.

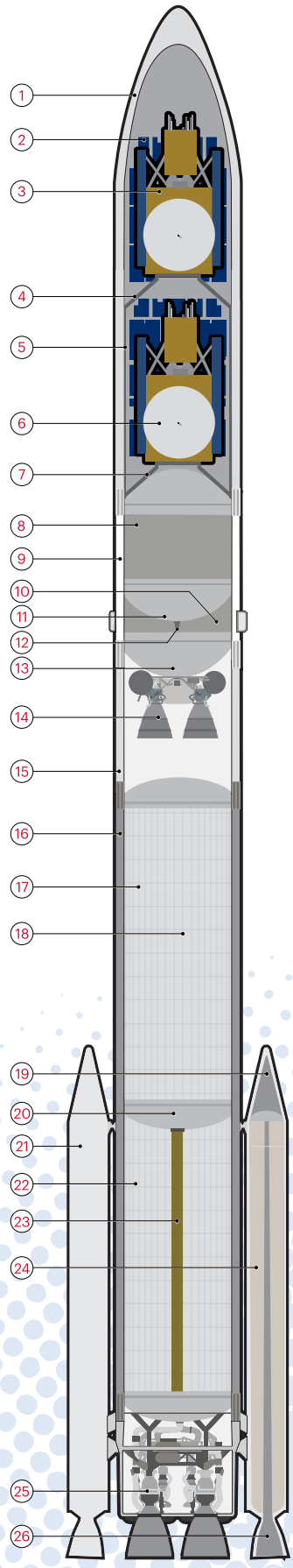
Thank you for sharing in our enthusiasm and joining us on this ride as we chart a path forward to transform the future of space launch.

Go Vulcan! Go Centaur! Go ULA!

Sincerely,

CUTAWAY VIEW

1. Payload Fairing
2. Fairing Acoustic Panels
3. Spacecraft
4. Forward Payload Attach Fitting
5. Multi-Launch Adapter
6. Spacecraft
7. Aft Payload Attach Fitting
8. Centaur Fuel (LH2) Tank
9. Centaur
10. Centaur Oxidizer (LO2) Tank
11. Common Bulkhead
12. Centaur Fuel (LH2) Feedline
13. Centaur Aft Bulkhead
14. Centaur Engine (RL10)
15. Interstage Adapter
16. Booster
17. Booster Oxidizer (LO2) Tank
18. Orthogrid Structure
19. Nose Cone
20. Common Bulkhead
21. Solid Rocket Booster (SRB)
22. Booster Fuel (Methane) Tank
23. Booster Oxidizer (LO2) Feedline
24. Solid Rocket Propellant
25. Booster Engine (BE-4)
26. Solid Rocket Booster Nozzle

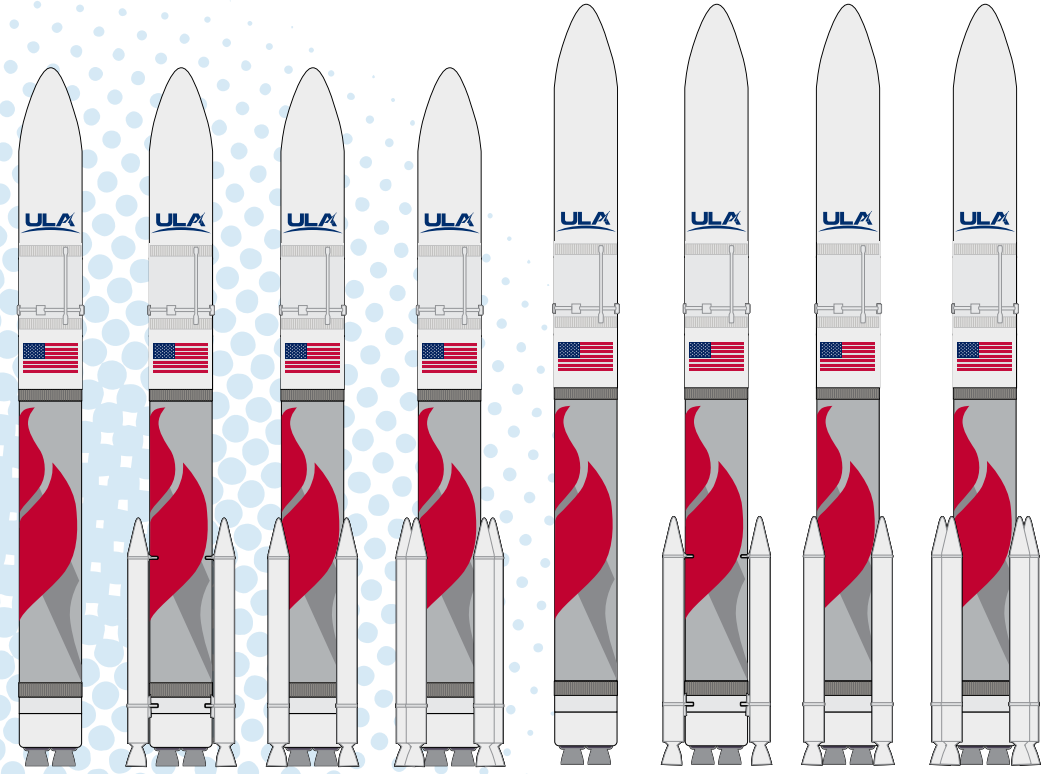


VC6L

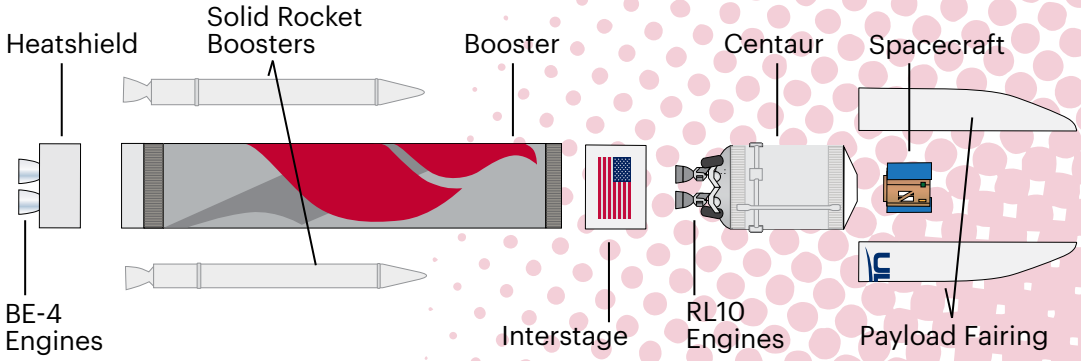
Vulcan Centaur
Number of SRBs (0, 2, 4, 6)
Length of Payload Fairing (Standard, Long)

Shown in Multi-launch Configuration

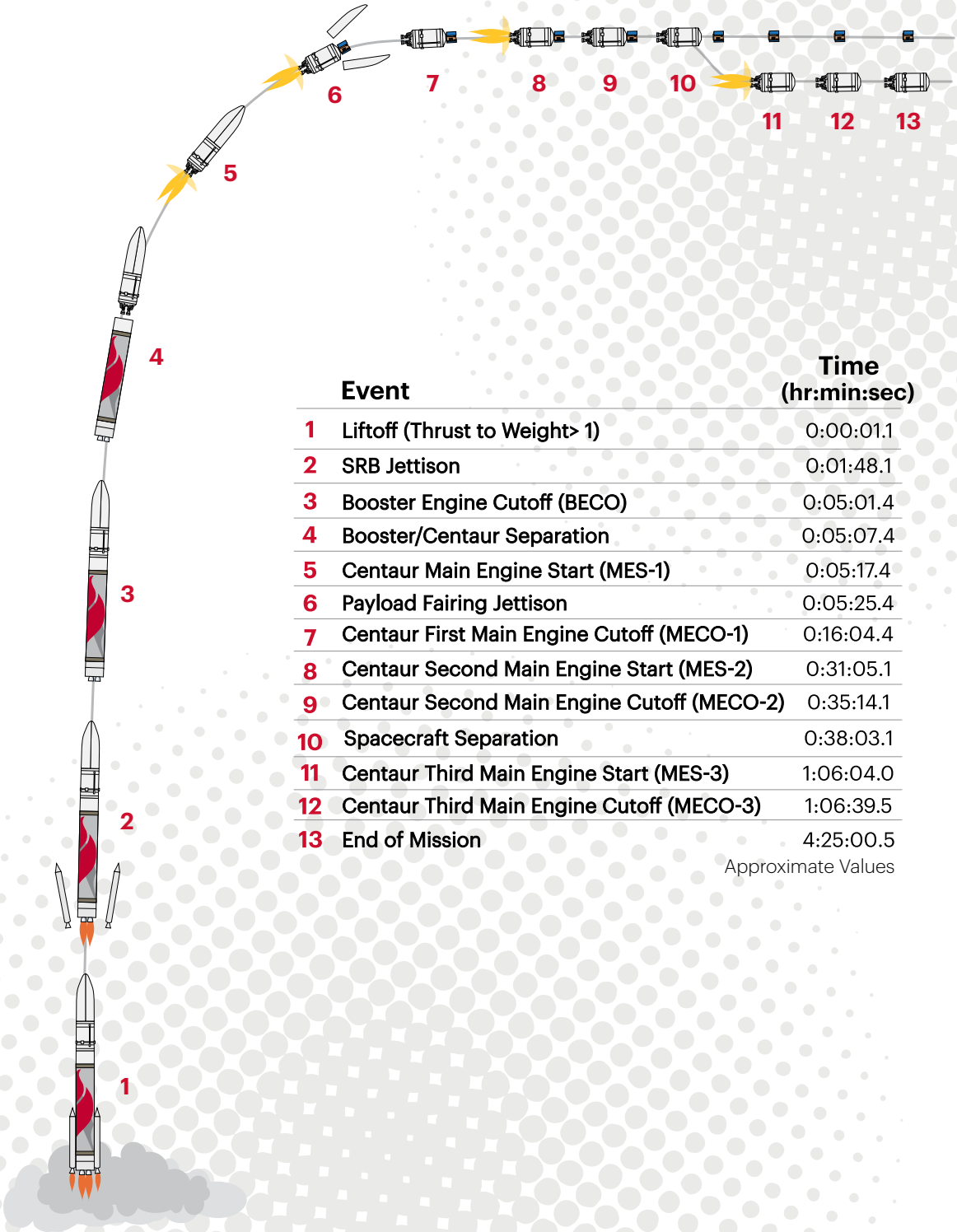
CONFIGURATIONS



EXPANDED VIEW



EXAMPLE FLIGHT PROFILE



	Event	Time (hr:min:sec)
1	Liftoff (Thrust to Weight> 1)	0:00:01.1
2	SRB Jettison	0:01:48.1
3	Booster Engine Cutoff (BECO)	0:05:01.4
4	Booster/Centaur Separation	0:05:07.4
5	Centaur Main Engine Start (MES-1)	0:05:17.4
6	Payload Fairing Jettison	0:05:25.4
7	Centaur First Main Engine Cutoff (MECO-1)	0:16:04.4
8	Centaur Second Main Engine Start (MES-2)	0:31:05.1
9	Centaur Second Main Engine Cutoff (MECO-2)	0:35:14.1
10	Spacecraft Separation	0:38:03.1
11	Centaur Third Main Engine Start (MES-3)	1:06:04.0
12	Centaur Third Main Engine Cutoff (MECO-3)	1:06:39.5
13	End of Mission	4:25:00.5

Approximate Values

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A TRIBUTE TO INDIGO

ULA's Rocket Ranch would like to pay tribute to Indigo and the Bruno family for sharing him with all of us. We wish him well as he explores pastures and his engineering expertise on horsepower, from this world and the next. He is missed by us all.


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