

A photograph of the Space Shuttle Endeavour (OV-105) on the launch pad. The shuttle is white with a large yellow external tank and two white solid rocket boosters. It is positioned vertically, surrounded by complex launch pad service structures. An American flag and a flag with the word 'ENDEAVOUR' are visible to the right. The sky is blue with some clouds. Overlaid on the image is the title 'Shuttle Processing' in a large, black, sans-serif font. Below the title, the name 'Kim Guodace' is displayed, followed by 'United Space Alliance, LLC (USA)' and 'Launch Site Integration'. At the bottom of the text block, it says 'OV-105, Endeavour, Vehicle Engineer'. A copyright notice is at the very bottom of the image.

# Shuttle Processing

Kim Guodace  
United Space Alliance, LLC (USA)  
Launch Site Integration  
OV-105, Endeavour, Vehicle Engineer


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A photograph of the Space Shuttle Endeavour (OV-105) on the launch pad. The shuttle is white with a large yellow external tank and two white solid rocket boosters. It is positioned vertically, surrounded by the complex metal structure of the launch pad. An American flag is visible on the right side of the frame. Overlaid on the image is the title 'Shuttle Processing' in a large, black, sans-serif font. Below the title, the name 'Kim Guodace' is displayed, followed by 'United Space Alliance, LLC (USA)' and 'Launch Site Integration'. At the bottom of the text block, it says 'OV-105, Endeavour, Vehicle Engineer'. A small copyright notice is visible in the bottom left corner of the image.

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A photograph showing the Space Shuttle Endeavour being mated to the External Tank and Solid Rocket Boosters by the Orbiter External Tank Mating Vehicle (OTMV) at the Kennedy Space Center. The shuttle is white with a large yellow external tank and two white solid rocket boosters. The orbiter is visible at the front, with the name "Endeavour" and the NASA logo. The OTMV is a complex structure with multiple levels and platforms, positioned to the left of the shuttle. An American flag is visible on the right side of the frame. The background shows a clear blue sky.

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# History of USA

- Came into existence September, 1995

- Parents — Lockheed Martin and Boeing

- Space Operations Program Contract (SPOC) implemented October 1, 2006

- Day-to-day management of the Space Shuttle fleet and planning, training, and operations for the ISS\*

- Major Subcontractor for Shuttle Processing

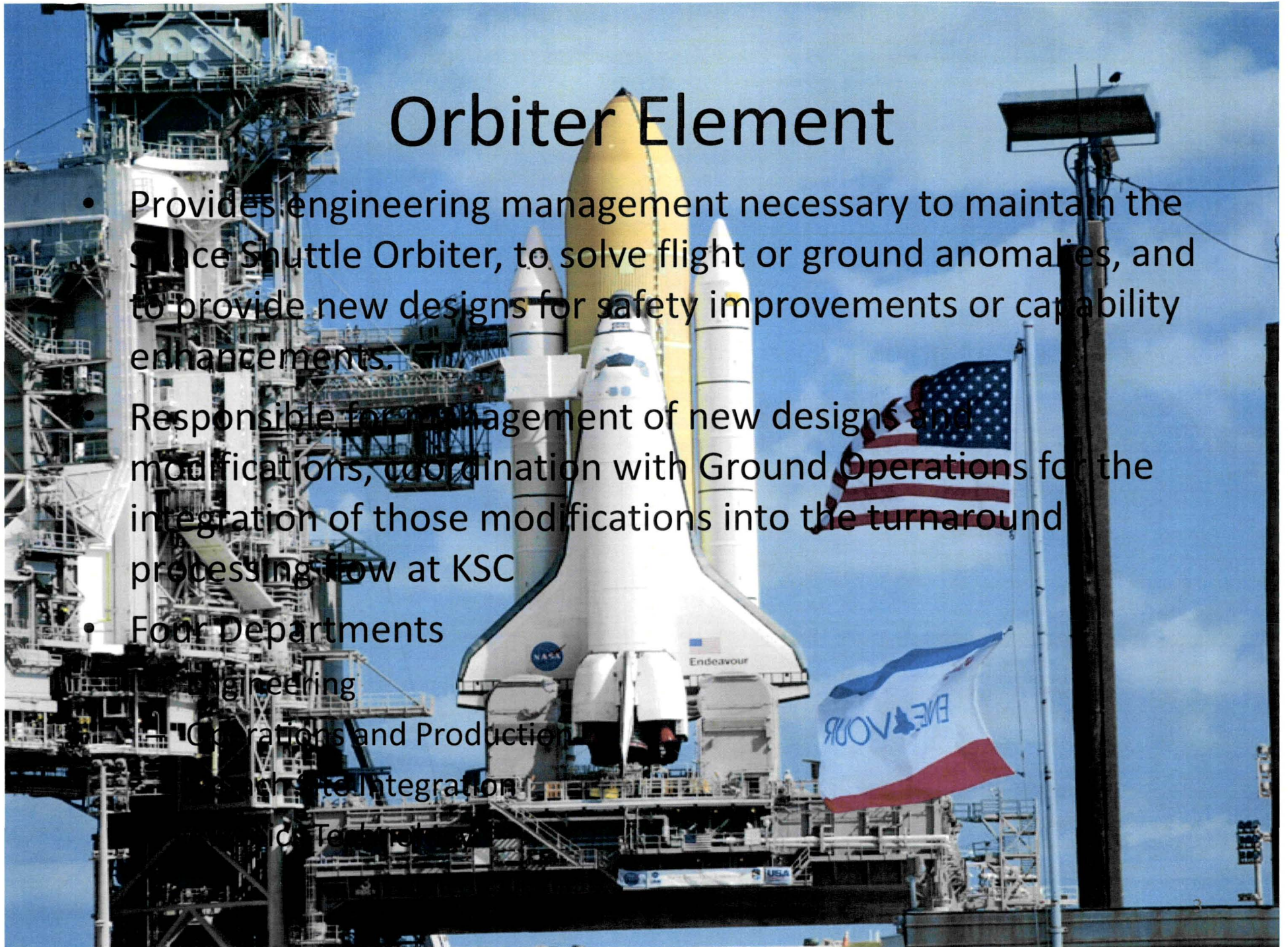
- Operations in Texas (HQ), Florida, Alabama and Washington, D.C.

- Employees approximately 8,800



# Orbiter Element

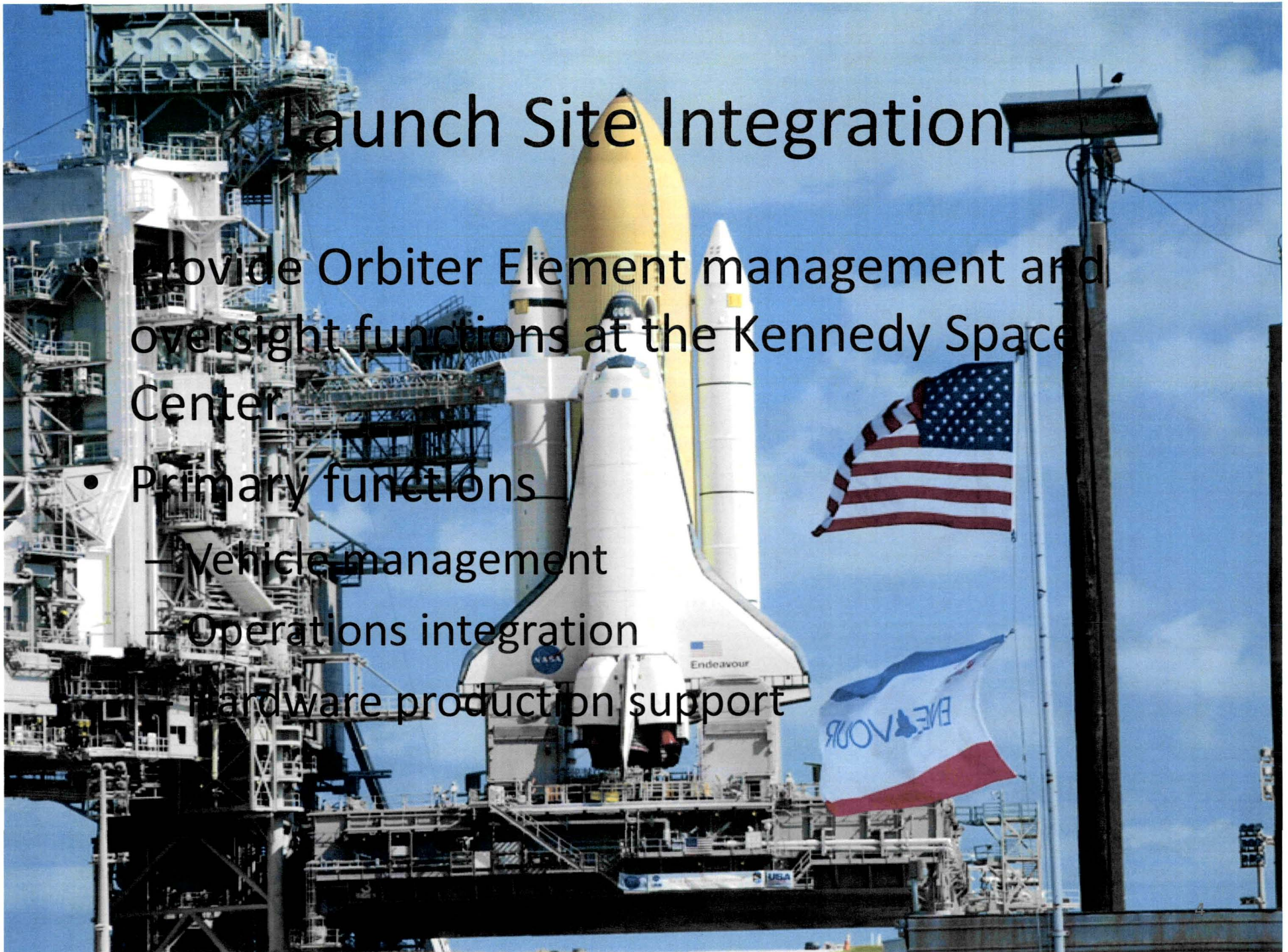
- Provides engineering management necessary to maintain the Space Shuttle Orbiter, to solve flight or ground anomalies, and to provide new designs for safety improvements or capability enhancements.
- Responsible for management of new designs and modifications, coordination with Ground Operations for the integration of those modifications into the turnaround processing flow at KSC
- Four Departments
  - Engineering
  - Operations and Production
  - Flight Site Integration
  - Orbiter Test Methods





# Launch Site Integration

- Provide Orbiter Element management and oversight functions at the Kennedy Space Center.
- Primary functions
  - Vehicle management
  - Operations integration
  - Hardware production support





# Launch Site Integration

- Integrate all the subsystem requirements across a vehicle, and/or across the fleet
- Work with Ground Operations on matters related to design changes, vehicle modifications, and fleet-wide issues
- Provide coordination and resolution of payload-to-orbiter issues
- Represent the program at Rollout Reviews and Flight Readiness Reviews

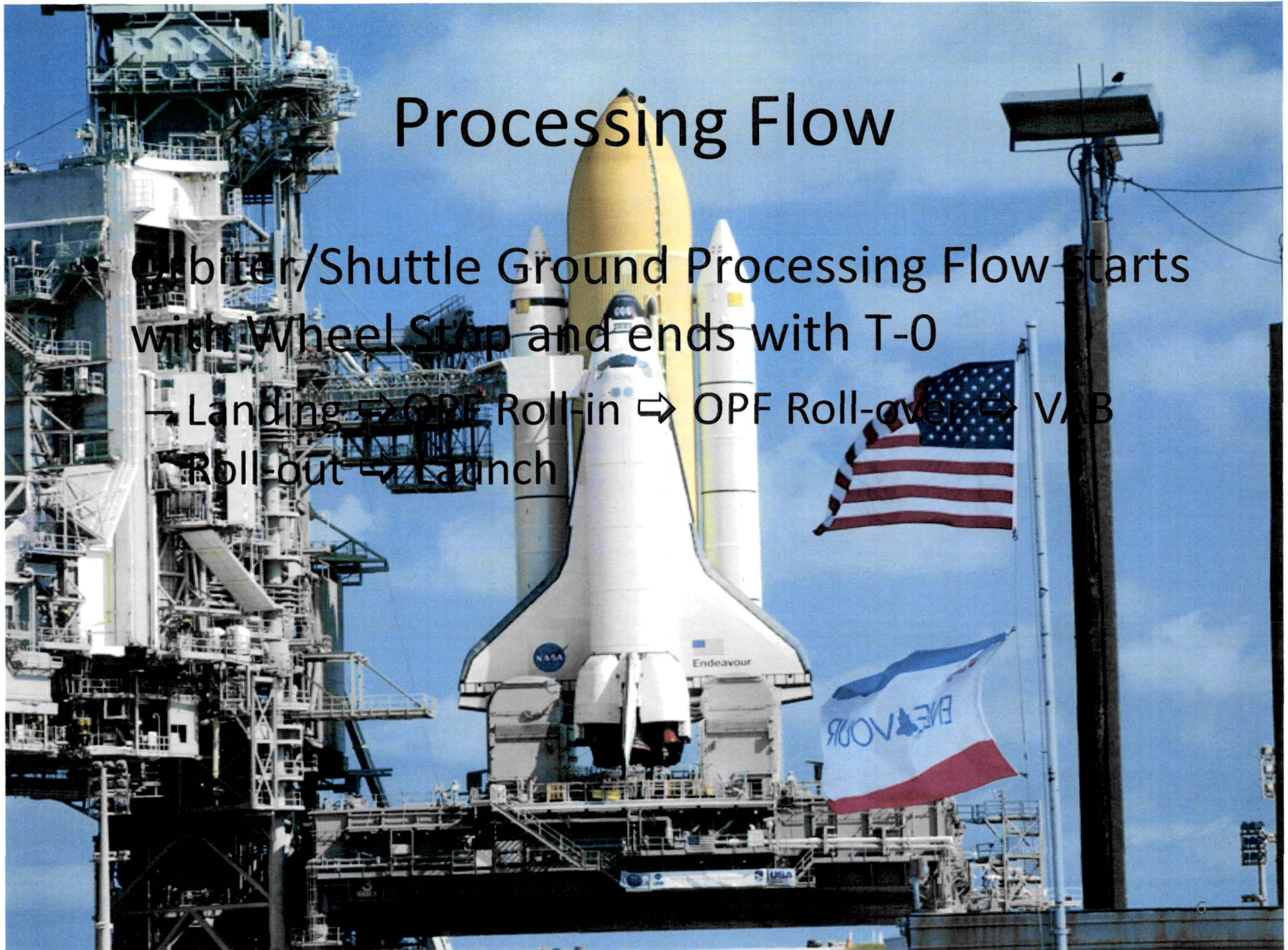




# Processing Flow

Orbiter/Shuttle Ground Processing Flow starts with Wheel Stop and ends with T-0

→ Landing ⇒ OPF Roll-in ⇒ OPF Roll-over ⇒ VAB Roll-out ⇒ Launch





# Processing Flow

## • Typical Flow times

- OPF flow extends approximately 3-4 months

- Varies from mission to mission

- Some slack is in the schedule depending on planned stay and planned work

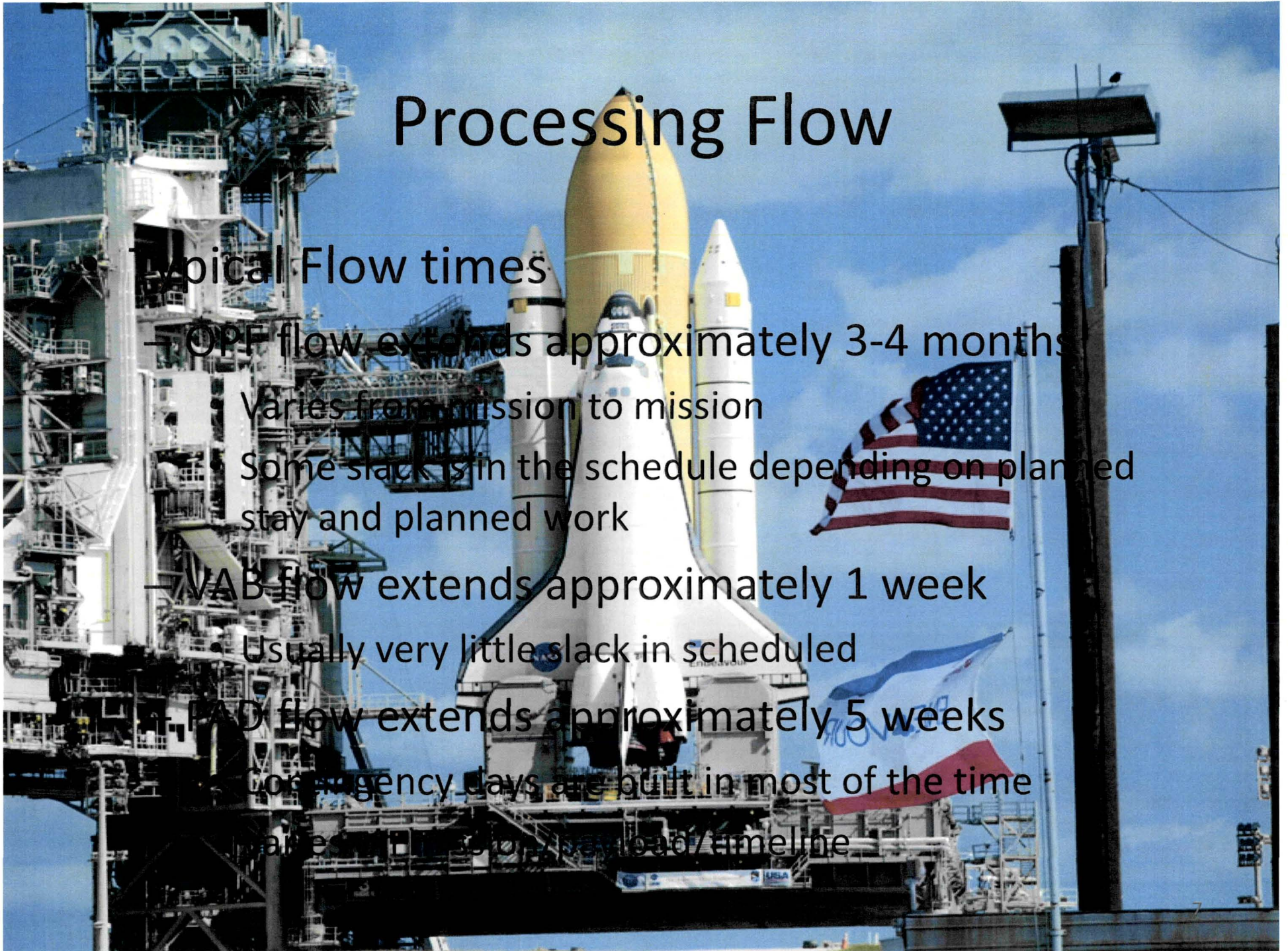
- VAB flow extends approximately 1 week

- Usually very little slack in scheduled

- PAD flow extends approximately 5 weeks

- Contingency days are built in most of the time

- Varies with mission payload/timeline





# Landing Ops

- After wheel stop, SCAPE (Self-Contained Atmospheric Protection Ensemble) crew performs evaluation of Orbiter to verify hazardous vapors are within limits
- Once area is deemed safe, Purge and Coolant Umbilical Access Vehicles are positioned behind the Orbiter and purge is hooked up
  - Purge air provides cool and humidified air conditioning to the payload bay and other cavities thereby removing any residual explosive or toxic fumes





# Landing Ops

- Once purge is hooked up, crew is escorted off the vehicle and ground crews enter the flight deck to prepare the Orbiter for tow to the OPF as well as perform initial inspections
  - Switch guards are installed, data packages from on-board experiments are removed, etc
  - External inspections of TPS, etc are then performed





# Landing Ops

- Approximately 4-5 hours after Wheel Stop, the Orbiter is then moved to the OPF





# Landing Ops (Dryden)

- Turnaround time varies – nominal ops run approximately 7 days from landing to SCA wheels up
- Travel time from Dryden to KSC is approximately 2 days, weather dependent






# OPF Ops

- OPF operations run approximately 3-4 months, starting with initial spotting in the OPF after landing to OPF roll-over to the VAB
- Inspections, testing, repairs, modifications, etc are performed during the OPF stay








# OPF Ops

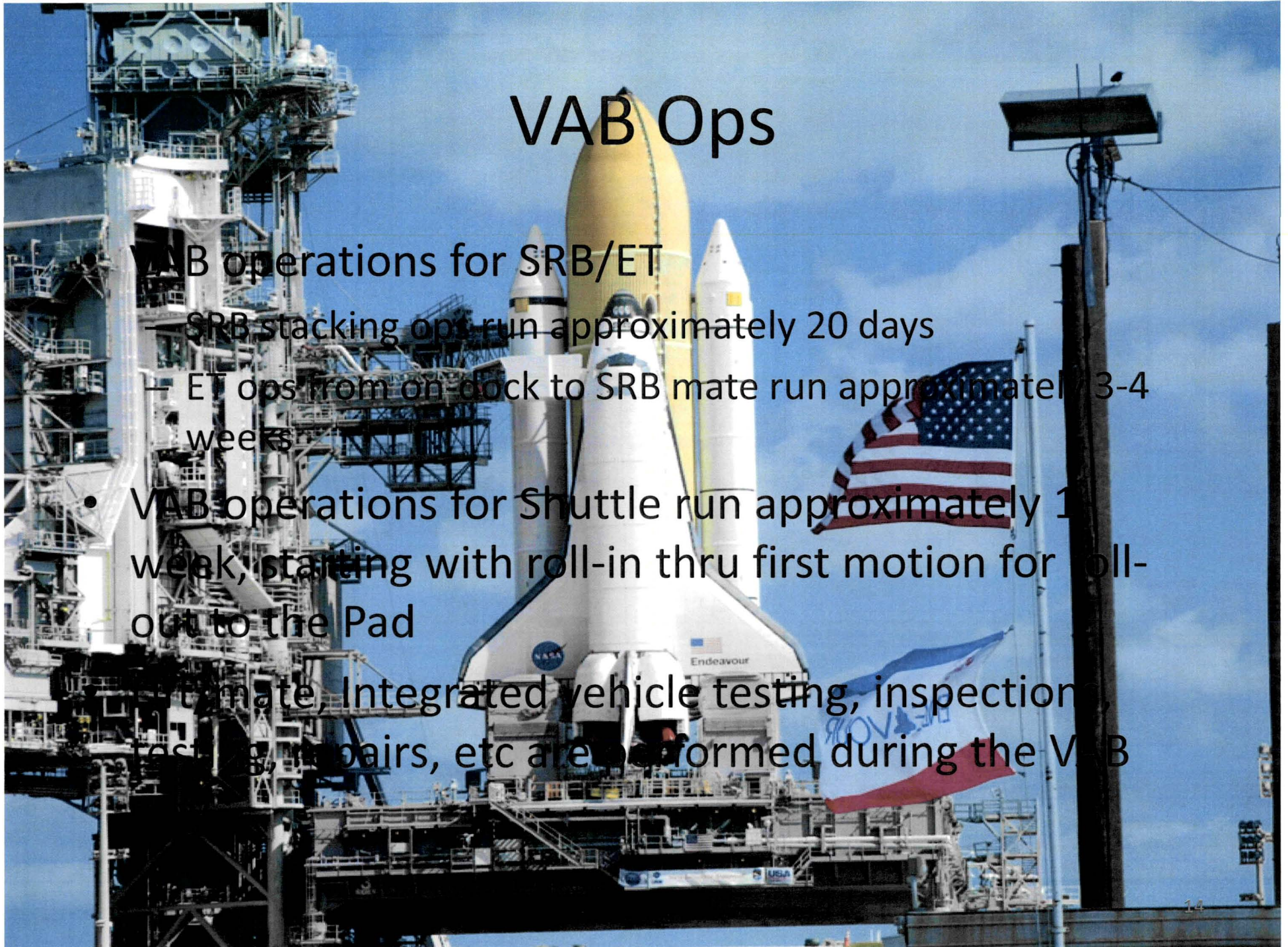
- Spotting in the OPF/Jack and Level
- Cargo Offload
- Payload Bay door opening/destow of payload
- RCC thermography
- SSME removal/installation
- OBSS removal/installation
- Nominal testing of electrical/mechanical systems
- MLG Tire R/R, brake inspections, NLG tire inspections
- Drag Chute Installation
- Payload pre-mate testing
- Payload Bay Door closure
- Weighing CG

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# VAB Ops

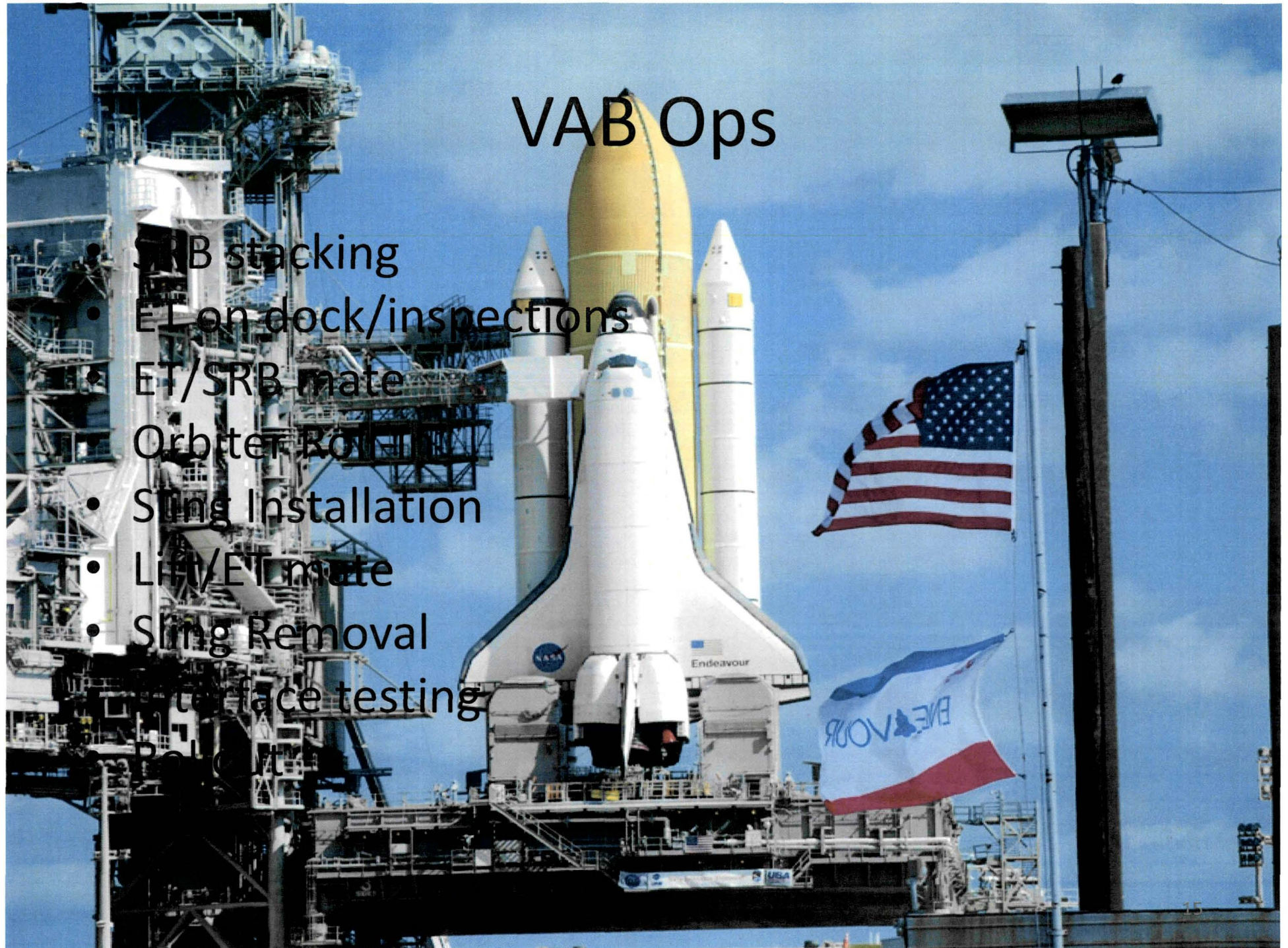
- VAB operations for SRB/ET
  - SRB stacking ops run approximately 20 days
  - ET ops from on-dock to SRB mate run approximately 3-4 weeks
- VAB operations for Shuttle run approximately 1 week, starting with roll-in thru first motion for roll-out to the Pad
- Ultimate, Integrated vehicle testing, inspections, testing, repairs, etc are performed during the VAB





# VAB Ops

- SRB stacking
- ET on dock/inspections
- ET/SRB mate
- Orbiter Rollout
- Sling Installation
- Lift/ET mate
- Sling Removal
- Interface testing
- Rollout





# Pad Ops

- Rollout

- Approximately 3 miles from VAB to Pad A
- Takes approximately 7 hrs, moving <1 mph

- Pad Validation

- Payload Installation

- TCDT (Terminal Count and Demonstration Test)

- Closeout

- Gate down

- Rollout





# Mission Ops

- Top
  - Mission Support
    - Mission Control (Houston)
    - Mission Evaluation Room (Houston)
  - Landing
    - KSC, FL
    - Dryden – Edwards Air Force Base, CA
    - White Sands, NM





# Shuttle Processing

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  - Avionics Technology



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- Rollout
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- Pad Validation
- Payload Installation
- TCDT (Terminal Count and Demonstration Test)
- Aft closeout
- Late Stow
- Countdown



# Mission Ops

- T-0
- Mission Support
  - Mission Control (Houston)
  - Mission Evaluation Room (Houston)
- Landing
  - KSC, FL
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