



# STS-128/17A Post-Mission Summary

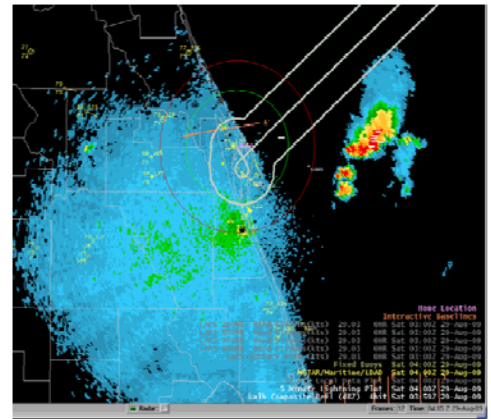
## NWS Spaceflight Meteorology Group



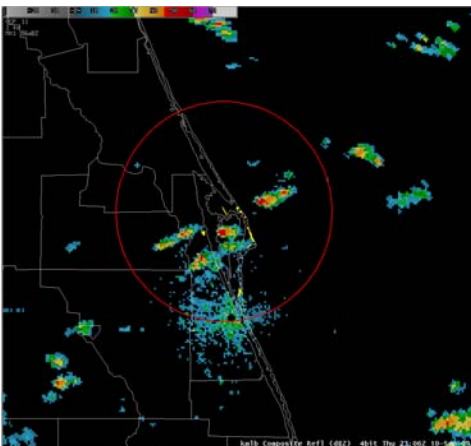
After one scrubbed launch attempt for weather and three scrubs due to a Liquid Hydrogen (LH2) fill/drain valve issue, space shuttle [Discovery](#) launched from [Kennedy Space Center \(KSC\)](#) Launch Complex 39A on August 29, 2009 at 0359 UTC (August 28, 2008 1059 PM CDT) and landed at Edwards AFB, CA on September 12, 2009 at 0053 UTC (September 11, 2009 7:53 PM CDT). Commander Rick “CJ” Sturckow and the [STS-128](#) crew successfully delivered [Expedition 20](#) crew member Nicole Stott to the International Space Station ([ISS](#)). Astronaut Tim Kopra joined the STS-128 crew as he left the ISS for his return trip home. The crew used the multipurpose logistics module, nicknamed Leonardo, to deliver supplies and equipment. Danny Olivas conducted three space walks, one with Stott and two with Swedish astronaut Chister Fuglesang. The first space walk centered on the removal of an ammonia tank assembly. The second space walk focused on replacing the old tank with a fresh ammonia tank. The final space walk was used to configure the ISS for additional missions and the new Tranquility module.

Weather on launch day was typical of Florida in the late summer. Showers and thunderstorms developed along the sea breeze and along several outflow boundaries across the state. These storms diminished around sunset, leaving behind addition surface boundaries that generated showers through the mid evening. As evening progressed one area of thunderstorm activity continued over the gulf stream of the Atlantic Ocean however it was beyond 20 nautical miles from the launch site and was never a real concern for the launch. The shower activity along the Florida coast diminished and conditions became GO for launch and RTLS.

Weather for landing operations was more complex. An upper level trough over the eastern Gulf of Mexico was causing unstable weather conditions prior to the planned End of Mission (EOM). As the trough moved through the eastern US, some drier air began to settle over northern Florida.



**Fig 1. WSR-88D radar image from KMLB Aug. 25, 2009 0601UTC**



**Fig 2. WSR-88D image from KMLB Sept 10, 2009 2305UTC**

One day before EOM, a stationary front was draped across central Florida with moist and unstable air to the south, and slightly drier air to the north. By Thursday (9/10) the surface front began to move slowly north, and several bands of showers formed over the Atlantic. These showers continued to move generally west at 10 mph. As afternoon wore on, daytime heating combined with the moist, unstable air and several boundaries to produce numerous rain showers within 30 nautical miles (nm) of KSC. Both KSC landing opportunities were forecast “NO GO” for showers and verified “NO GO” due the shower activity near KSC. The weather forecast for Friday (9/11) was “NO GO” again for thunderstorms within 30 nm of KSC. The stationary front had moved northward overnight and was near KSC with increasing moisture and instability. Once again, with daytime heating and several surface boundaries in place, showers and developed during the late morning hours and persisted through late afternoon. Both landing opportunities at KSC were waved

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off. The weather forecast for EOM+2 at KSC showed no significant improvement for Saturday.

The weather forecast for Edwards Air Force Base (EAFB) in California, showed an upper level trough approaching from the Pacific Ocean by Saturday (EOM+2). This trough was expected to cause the surface winds on Saturday to increase from the southwest, gusting beyond the flight rule limits. Another stronger trough was forecast to approach California by Sunday with even stronger and gustier winds at EAFB. The Flight Director made the decision to target Edwards AFB in California for an early evening landing on Friday.

Conditions Friday afternoon at EAFB were partly cloudy with east to northeast winds at the surface. By afternoon, a wind shift boundary was evident from the surface pressure analysis and began to appear on the weather radar products. This wind shift continued to move east toward the airfield at EAFB, and the best timing tools suggested it would be over the airfield shortly after 0100 UTC. The winds were expected to shift from east southeast at 10 knots to southwest at 10 to 20 knots. By 0015 UTC, forecast confidence was high enough to amend the surface wind to southeast at 10 knots. The upper winds forecast was updated from the surface to 10,000 feet. Discovery touched down on runway 22 under partly cloudy skies at 0053 UTC with east southeast winds around 10 knots. At 0119 UTC the wind towers on the western end of runway 22 shifted to southwest with gusts to 15 knots.

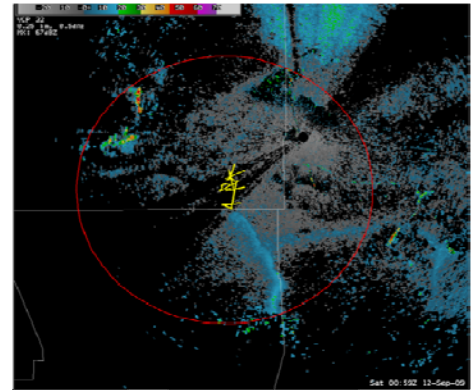


Fig 3. WSR-88D image from KEDW  
Sept 12, 2009 0059 UTC

The entire SMG team provided forecasts and decision support guidance to the Hypersonic Thermodynamic InfraRed Measurements (HYTHIRM) team. The [HYTHIRM](#) project collects data from the thermal protection systems (TPS) of the shuttles as they re-enter earth's atmosphere. High resolution imagery is recorded from a military aircraft that was flying along Discovery's ground track. The project's success hinged on getting the aircraft to the correct landing site and having a clear view of the TPS as Discovery made its "banking S-turns" at hypersonic speed.

For this 128th Shuttle mission, Spaceflight Meteorology Group (SMG) lead forecaster Kurt Van Speybroeck provided launch abort landing and EOM landing forecasts and analyses to the Mission Control Center. STS-128 Assistant Lead/TAL forecaster Tim Oram issued weather forecasts for the Transoceanic Abort Landing (TAL) sites at Zaragoza, Spain; Moron, Spain; and Istres, France. Techniques Development Unit meteorologist Doris Hood issued upper air forecasts for launch, RTLS, and landing opportunities at KSC, and upper winds forecast updates for EDW, and monitored weather computing systems.

Submitted by: Kurt M. Van Speybroeck Lead Meteorologist