

Date: 26 July 2017  
To: Thai Aviation Services Limited  
Attention: James O'Brien  
Regarding: S-76D Uncommanded Shutdown - Follow On Questions  
Technical Case #: C0066247

James O'Brien,

1. Can the rain pool in the plenum scroll in flight with the engine at IDLE?

The only documented occurrence of water pooling in operations is a case of extended ground running (>20 minutes) at ground idle power (lower power than flight) and no forward airspeed. In flight the engine power is higher than ground idle and the lowest engine powers which do occur are accompanied by forward airspeed. At higher engine power the engine is ingesting whatever water is not bypassed at steady rate rather than allowing the water to collect for sudden high quantity ingestion. Operation of the engine at ground idle in flight is an emergency condition when power is commanded to idle by the pilot for other engine condition of concern (i.e. chips or low oil press/high oil temp). The collection of water in this ground idle condition is less likely in flight than on the ground case because of improved bypass separation with forward airspeed but Sikorsky has not conclusively proven that water collection it cannot occur for the ground idle condition. But the concern of water collection and effect on power recovery when throttle is returned to FLY prior to landing should be balanced by the fact that the engine may not recover power in the first place due to the initial reason why power was commanded to idle (i.e. chips or oil condition). As such the landing in this emergency condition should conservatively plan for the possibility of not attaining full dual engine power.

2. Will the inertial separation design of the EAIA cause the rain water to follow the aft bypass duct (not enter the plenum scroll), regardless of the operating condition of the engine?

See response to #3 regarding separation design. Some water will not be separated but rather continuously drawn into the engine. The engine is qualified to FAR 33.78 (b) for rain exposure of at least 4% water to inlet air flow ratio. At powers higher than ground idle, whatever rain is not separated is drawn into the engine at steady rate so that it does not collect in the inlet scroll. In the ground flameout incident, there was low bypass separation and the engine power was sufficiently low not to continuously draw that water into the engine, so that it collected in the inlet. As power was increased, the engine did ingest the water, however now a higher collected quantity in sudden ingestion

3. Please confirm the bypass function of “ram” air from airspeed, not engine suction.  
The efficiency of the bypass is a function of both ram airspeed and the ejector effect of the engine exhaust. The efficiency is reduced as either source of motive flow is reduced, however it nonetheless can be effective with only one of the sources...i.e. power higher than idle on the ground with zero airspeed, or forward flight with low engine power

Regards,



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