REPORT: PRECISE APPROACHES AT SEATTLE-TACOMA INTERNATIONAL AIRPORT ENHANCE ROUTE AND FUEL EFFICIENCY

As part of the "Greener Skies" initiative to help airlines enhance operational efficiency, Boeing has designed and implemented precise Area Navigation, Required Navigation Performance – RNAV (RNP) approaches for airports, including Seattle-Tacoma International. Alaska Airlines recently has implemented these RNAV (RNP) procedures into operation, which increases airspace capacity, reduces carbon emissions and can decrease flight times through more efficient design. The Greener Skies initiative is part of the FAA's plan to modernize the National Airspace System by 2025 – the Next Generation Air Transportation System.

To design Seattle-Tacoma International Airport RNAV (RNP) procedures, Boeing used a specific methodology for modeling environmental performance of aircraft. This process allowed the team to model efficient flight trajectories to enhance analysis of flight performance. Boeing then was able to establish and document RNAV (RNP) environmental performance benefits for airline operations, including fuel, emissions, distance and time enhancements.

In comparing a typical Alaska Airlines 737-800W aircraft descent for arrival at Seattle-Tacoma International Airport's runway 16R, the precise RNAV (RNP) procedure clearly provides environmental benefits over traditional descent paths. When comparing an RNAV (RNP) approach to the standard earliest approach vector turn, the standard typical approach vector turn and the standard bad weather approach turn procedure for runway 16R, revealed the following savings per flight:

- The RNAV (RNP) approach will eliminate 589 lbs of fuel consumed, or 87 gallons, when compared to the typical approach turn and 746 lbs, or 110 gallons, compared to the bad weather approach turn.
- Carbon emissions also are greatly reduced, using the RNAV (RNP) procedure. The example RNAV (RNP) approach procedure reduces 1,858 lbs of emissions compared to the typical approach turn and 2,354 lbs compared to the bad weather approach turn. The RNAV (RNP) approach will eliminate approximately 1 metric ton of emissions, compared to the bad weather approach turn.
- The same RNAV (RNP) approach eliminates 8.8 minutes compared to the typical approach turn and 7.2 minutes compared to the bad weather approach turn.
- The RNAV (RNP) approach reduces distance traveled by 19 nm compared to the typical approach vector turn and eliminates 23.5 nm traveled when compared to the traditional bad weather vector turn approach procedure.

In all, the RNAV (RNP) procedures at Seattle-Tacoma International Airport work to enhance operating efficiency for airlines such as Alaska, who fly more precise approach routes to reduce emissions, increase airspace capacity and reduce flight times. Looking ahead, the Greener Skies initiative promises to further enhance the efficiency of RNAV (RNP) approaches through the development of refined guidelines and procedures for airlines to follow.

Summary of Example RNAV (RNP) Benefits, Seattle-Tacoma International Airport:

ARRIVALS TO KSEA RWY 16R					Estimated Benefits Re: HAWKS RNAV (RNP) Z			
Arrival	Distance (nmi)	Time (min)	Fuel (lb)	CO_2 (lb)	Distance (nmi)	Time (min)	Fuel (lb)	CO_2 (lb)
RNAV (RNP) Z RWY 16R ASA 537 – HAWKZ	122.1	24.7	839	2,647	Baseline			
Earliest Approach Vector Turn Flight 548 – HAWKZ	126.8	28.7	1,137	3,587	4.7	4.0	297	937
Typical Approach Vector Turn ASA Flight 593 -OLYMPIA	141.1	33.5	1,428	4,505	19.0	8.8	589	1,858
Bad Weather Vector Turn ASA Flight 559 – HAWKZ	145.6	31.9	1,585	5,000	23.5	7.2	746	2,354