NASA/TP-20220015673

Semispan Test Results of an Active Flow Control Enabled High-Lift Common Research Model in Landing Configuration

John C. Lin, Latunia P. Melton, Judith A. Hannon, Marlyn Y. Andino,
Mehti Koklu, Keith B. Paschal, and Veer N. Vatsa
Langley Research Center, Hampton, Virginia

December 2022

NASA STI Program Report Series

Since its founding, NASA has been dedicated to the advancement of aeronautics and space science. The NASA scientific and technical information (STI) program plays a key part in helping NASA maintain this important role.

The NASA STI program operates under the auspices of the Agency Chief Information Officer. It collects, organizes, provides for archiving, and disseminates NASA's STI. The NASA STI program provides access to the NTRS Registered and its public interface, the NASA Technical Reports Server, thus providing one of the largest collections of aeronautical and space science STI in the world. Results are published in both non-NASA channels and by NASA in the NASA STI Report Series, which includes the following report types:

- TECHNICAL PUBLICATION. Reports of completed research or a major significant phase of research that present the results of NASA Programs and include extensive data or theoretical analysis. Includes compilations of significant scientific and technical data and information deemed to be of continuing reference value. NASA counterpart of peer-reviewed formal professional papers but has less stringent limitations on manuscript length and extent of graphic presentations.

- TECHNICAL MEMORANDUM. Scientific and technical findings that are preliminary or of specialized interest, e.g., quick release reports, working papers, and bibliographies that contain minimal annotation. Does not contain extensive analysis.

- CONTRACTOR REPORT. Scientific and technical findings by NASA-sponsored contractors and grantees.

- CONFERENCE PUBLICATION. Collected papers from scientific and technical conferences, symposia, seminars, or other meetings sponsored or co-sponsored by NASA.

- SPECIAL PUBLICATION. Scientific, technical, or historical information from NASA programs, projects, and missions, often concerned with subjects having substantial public interest.

- TECHNICAL TRANSLATION. English-language translations of foreign scientific and technical material pertinent to NASA's mission.

Specialized services also include organizing and publishing research results, distributing specialized research announcements and feeds, providing information desk and personal search support, and enabling data exchange services.

For more information about the NASA STI program, see the following:

- Access the NASA STI program home page at http://www.sti.nasa.gov

- Help desk contact information:

https://www.sti.nasa.gov/sti-contact-form/
and select the "General" help request type.

NASA/TP-20220015673

Semispan Test Results of an Active Flow Control Enabled High-Lift Common Research Model in Landing Configuration

John C. Lin, LaTunia P. Melton, Judith A. Hannon, Marlyn Y. Andino,
Mehti Koklu, Keith B. Paschal, and Veer N. Vatsa
Langley Research Center, Hampton, Virginia

National Aeronautics and
Space Administration

Langley Research Center
Hampton, VA 23681

December 2022

Acknowledgments

This R&D effort was sponsored by the High Aspect Ratio Wing Subproject under the NASA Advanced Air Transport Technology (AATT) Project. The effort involved many people who provided valuable contributions that made a successful test possible. The authors would like to acknowledge and thank all those involved for their great support throughout this investigation. Some key personnel are as follows.

Model design: Jared Fell (design team lead), Sandy Webb, Miranda Snyder, Christopher Laws, Reggie Kidd, John Mulvaney, Mark Cagle, David Lewis, Nigel Schneider, Dave Castle, Douglas Weber, William Langford, and Ray Rhew, as well as NASA interns Jacob Ganzak and Steven Call.

Model fabrication: Stephen Geissinger, Christopher McLain, Danny Lovaglio, Robert Andrews, and Thomas Hall.

14x22 air supply system and AFC plumbing: Joe Giuliana and Robert Kyle.

14x22 managerial staff: Frank Quinto (Facility Manager), Ashley Dittberner (Operation Manager), William Krieger (Facility Safety Head), Joseph Burton (Facility Coordinator).

14x22 test engineers: James Byrd (Lead), Abigail Cayton, Jeremy Ulanday, and Samantha Zauber.

14x22 technicians and supporting staff:
- Lead Technician - Ronald Hunter
- Mechanical Technicians - Kyle Deaver (Lead), Joshua Beasley, Marvin Le Gendre, Andrew Sawyer, Cassandra Stevens, and Patricia Christian
- Instrumentation Technician - Andrew Harrison, Benjamin Lester, and Neil Coffey
- Electrical Technician - Stuart Dale Bennett and Leon Adams
- Data System - Andy Boney (Manager), Benjamin Trower, and Charlotte Teague
- Facility Equipment Specialist - Karl Maddox
- Environmental Coordinator - Joseph Burton, Jr.
- High Pressure Air Support - Michael Henshaw and Robert Askew

CRM-HL CFD data: David Lockard and Melissa Rivers
CRM-HL consultation: Douglas Lacy of Boeing Commercial Airplanes.

Available from:

NASA STI Program / Mail Stop 148
NASA Langley Research Center
Hampton, VA 23681-2199
Fax: 757-864-6500

Abstract

A 10%-scale semispan, Active Flow Control (AFC) enabled, simplified high-lift version of the Common Research Model (CRM-SHL-AFC) was tested in the 14- by 22-Foot Subsonic Tunnel at the NASA Langley Research Center. The main objective of the test was to develop an AFC system that can provide the necessary lift recovery on a simple-hinged flap high-lift system while minimizing its pneumatic power requirement. Three new types of AFC approaches were examined: Double-Row Sweeping Jets (DRSWJ), Alternating Pulsed Jets (APJ), and High Efficiency Low Power (HELP) actuators. The DRSWJ and the APJ actuators used two rows of unsteady jets, whereas the HELP actuators used an upstream row of sweeping jets combined with a downstream row of steady jets to overcome strong adverse pressure gradients. The test was conducted mostly at a freestream Mach number of 0.20. For exploration purposes, a limited number of runs were made at lower Mach numbers or using vortex generators (VGs). Minimal sensitivity to Mach number or VGs, for the cases evaluated, were observed. The AFC-induced lift coefficient increment was maintained over the AFC-off case for most flow-control cases examined. The CRM-SHL-AFC configuration equipped with HELP actuation was the only actuator configuration able to match or exceed the targeted lift performance of a reference conventional high-lift configuration. The presented aerodynamic data include lift, drag, and pitching moment coefficients as a function of angle of attack, with and without the Transonic Wall Interference Correction System (TWICS) method applied. Lift increments as a function of AFC pneumatic power usage (i.e., nozzle pressure ratio, mass flow, momentum coefficient, and power coefficient) are also presented at a lower angle of attack (α = 8.9°) and at maximum lift (α = 17.1°). At the two angles of attack, the surface pressure distributions and autospectral densities from the unsteady pressure transducers for the AFC-off case and the best HELP actuation case are compared.

Nomenclature

A_n	=	total area of all active nozzle exits
b	=	wing semispan; 115.7 inches
C_D	=	drag coefficient; (drag force)/($S \cdot q_\infty$)
$C_{D,u}$	=	drag coefficient without wall correction; (drag force,$_u$)/($S \cdot q_{\infty,u}$)
C_L	=	lift coefficient; (lift force)/($S \cdot q_\infty$)
$C_{L,u}$	=	lift coefficient without wall correction; (lift force,$_u$)/($S \cdot q_{\infty,u}$)
C_p	=	pressure coefficient; $(p - p_\infty)/q_\infty$
C_m	=	pitching moment coefficient; (pitching moment)/($S \cdot c_r \cdot q_\infty$)
$C_{m,u}$	=	pitching moment coefficient without wall correction; (pitching moment,$_u$)/($S \cdot c_r \cdot q_{\infty,u}$)
C_Q	=	mass flow coefficient; $\dot{m}/(\rho_\infty \cdot S \cdot U_\infty)$
C_μ	=	momentum coefficient; $\dot{m}^2/(\rho_n \cdot A_n \cdot q_\infty \cdot S)$
$C_{\mu,u}$	=	momentum coefficient without wall correction; $\dot{m}^2/(\rho_n \cdot A_n \cdot q_{\infty,u} \cdot S)$
C_π	=	power coefficient; $(C_Q \cdot P_a)/q_\infty$
$C_{\pi,u}$	=	power coefficient without wall correction; $(C_Q \cdot P_a)/q_{\infty,u}$
c_{MAC}	=	mean aerodynamic chord; 27.6 inches
f	=	frequency
G_{pp}	=	autospectrum density of fluctuating pressure
M_∞	=	freestream Mach number
$M_{\infty,u}$	=	freestream Mach number without wall correction
$\dot{m}$	=	total mass flow rate
P_a	=	actuator plenum pressure
p	=	pressure
p_∞	=	freestream static pressure
q_∞	=	freestream dynamic pressure

$q_{\infty,u}$ = freestream dynamic pressure without wall correction
Re = unit Reynolds number; per foot
$Re_{,u}$ = unit Reynolds number per foot without wall correction
Re_{MAC} = Reynolds number based on mean aerodynamic chord (c_{MAC})
S = semispan wing reference area; 2,973 inches^2
U_∞ = freestream velocity
x, y, z = coordinates along the model longitudinal axis, lateral axis, and normal axis, respectively
α = angle of attack
α_u = angle of attack without wall correction
Δ = differential value
$\Delta\alpha_{wc}$ = α minus α_u
$\Delta q_{\infty,wc}$ = q_∞ minus $q_{\infty,u}$
η = normalized spanwise location; y/b
θ = azimuth angle
ρ_∞ = freestream density
ρ_n = air density at the actuator nozzle

Introduction

Wind tunnel testing on high-lift systems was performed as part of the Advanced Air Transport Technology (AATT) Project goals to reduce fuel burn for modern civil transport aircraft. The test explored the possibility of using Active Flow Control (AFC) [1,2] to provide the required lift performance while reducing the cruise drag associated with the external mechanisms used to deploy a slotted flap during high-lift operations [3-5]. System integration studies indicated that up to a 2.25% fuel burn reduction is possible if an AFC-enabled simplified high-lift system (i.e., simple-hinged flaps inboard and outboard) could provide the necessary lift recovery at the approach angle of attack [4]. The fuel burn reduction was based upon a resized AFC variant of the ERA-0003 concept aircraft that trades both wing area and engine size such that it minimizes fuel burn while meeting all design requirements and constraints for the overall flight from takeoff to landing. The AFC-related performance gains are primarily due to the 3.3-count excrescence drag reduction obtained by the removal of the external fairings for the Fowler flap mechanism (see Fig. 1(a) for a typical example [6]). However, developing an AFC system that can provide the necessary lift recovery on a simple-hinged flap high-lift system (Fig. 1(b)) while minimizing the pneumatic power usage is considered a major challenge.

AFC has been proposed to achieve the high-lift aerodynamic performance enhancement while reducing the system part count and associated external drag [3,4,7]. Steady blowing through slots as well as AFC actuators — such as synthetic jet actuators, fluidic oscillators, plasma actuators, etc. — have been proposed in the literature [2]. The synthetic jet and plasma actuators are operated by electric power and have been examined for low to moderate adverse pressure gradients due to their limited flow control authority. Steady blowing and fluidic oscillators (often referred to as sweeping jet actuators) use pneumatic power and have been successfully used in various flow control configurations. For example, steady blowing from the two-dimensional slot at the flap shoulders (often referred to as circulation control or CC) has proven to be effective on a high-lift wing [8,9] that was designated as the Fundamental Aerodynamic Subsonic Transonic-Modular Active Control (FAST-MAC) model. A CC system using steady slot blowing can usually provide the necessary lift required for airfoils or wings with high flap deflections. However, one drawback of a steady blowing CC system is that it may require more pneumatic power (combination of mass flow and pressure) than what realistically can be implemented on an aircraft from a system integration standpoint (e.g., excess weight penalty).

It has been shown that unsteady AFC can be more beneficial for controlling two-dimensional separated flow because it requires less mass flow input while satisfying the output requirements [1]. Sweeping jet actuators are a type of unsteady fluidic oscillator that have been shown to be reliable and efficient flow-control devices both in wind tunnel [8, 10–20] and flight [21] tests. High Reynolds number wind tunnel tests [8] with AFC on the FAST-MAC model proved the mass flow efficiency of the sweeping jet actuators, which produced a 54.7% reduction in mass flow usage at $\Delta C_L \approx 0.4$ compared to the steady CC blowing, as shown in Fig. 2 [8]. In the figure, Actuator A has a total sweep angle of ±45°, while Actuator AA has a sweep angle of ±35.5°. However, these actuators did not produce $\Delta C_L > 0.4$ because the exit-jet flows were choked at the actuator nozzle, which limited their flow-control effectiveness. This is due to the geometric constraint of the actuators, as a certain minimum internal space (for the feedback channels) is required for each sweeping jet actuator. For example, if the individual actuator's nozzle area becomes large, then the spanwise spacing has to be increased, which offsets the increase in the total nozzle area because of fewer nozzles for a given span. Consequently, this limitation on the jet exit nozzle area causes the flow to choke prematurely (i.e., before input momentum or mass flow is sufficient for flow reattachment). The DRSWJ and APJ actuators have smaller throat exit areas requiring higher exit velocities to achieve a given mass flow rate when compared to the HELP actuator. This means that the DRSWJ and APJ actuators reach choked flow (sonic throat conditions) at lower mass flow rates than the HELP actuators. Increases in mass flow are smaller once the flow chokes because they are due to changes in density. With the NPR limit of 3.0, the mass flow rates achieved with the DRSWJ and APJ actuator were not large enough to meet the target lift increment. The NPR for choked flow in the SWJ was not measured but schlieren flow visualization results indicate that the flow is typically choked/sonic at the exit when NPR~2.0.

The current high-lift research effort involves an AFC-enabled high-lift configuration that is a variant of the "open" conventional high-lift configuration (CRM-HL), as reported by Lacy and Sclafani [22]. The 30° slat and most of the main wing, with the exception of the trailing edge/cove components, were the same between the AFC-enabled high-lift configuration (CRM-SHL-AFC) and the conventional CRM-HL geometry. The current study was focused on the trailing-edge flow separation control; therefore, there was no geometrical variation elsewhere. A 10%-scale CRM-SHL-AFC equipped with highly deflected simple-hinged flaps (≥ 50°) was successfully built and tested at the NASA Langley Research Center (LaRC) during the fall of 2018 [23–28]. A parallel CFD effort had been closely coordinated with the experimental activities in providing prediction and guidance on the performance of AFC actuators [29,30]. The primary objective of the current research was to develop an AFC system that can provide the necessary lift recovery on a simple-hinged flap high-lift system (i.e., $\Delta C_L \geq 0.5$) while minimizing its pneumatic power requirement. The test was conducted mostly at a freestream Mach number of 0.20 and Reynolds number of ~3.3 x 10^6 based on the mean aerodynamic chord. Lower Mach number runs where higher C_q and C_μ values could be achieved with the three actuator concepts were performed to study the reattachment process when using actuators that did not meet the lift target at M_∞=0.20.

As a companion documentation to previous CRM-SHL-AFC publications [23–30], this paper documents the NASA LaRC 14- by 22-Foot Subsonic Tunnel (14x22) test results of the CRM-SH-AFC in significantly more detail. The presented aerodynamic dataset includes lift, drag, and pitching moment coefficients as a function of angle of attack with and without the Transonic Wall Interference Correction System (TWICS) method [31–33] applied. TWICS can be used for subsonic flows and the code is also used at the LaRC National Transonic Facility. Readers should note that any CFD performed on the CRM-HL without the tunnel walls should be compared to the test data with the wall correction. However, if a CFD simulation includes the tunnel walls, e.g., as reported by Vatsa et al. [29,30], then the results should be compared to the data without the wall correction. Lift increments as a function of AFC pneumatic power usage (i.e., nozzle pressure ratio, mass flow, momentum coefficient, and power coefficient) are also presented. Surface pressure distributions and autospectral densities from the unsteady pressure transducers for the AFC-off case and best HELP actuation case are compared and discussed.

Experimental Setup

A. Wind Tunnel

The wind tunnel experiment was performed at the 14x22 [34]. The 14x22 is an atmospheric, closed return wind tunnel with a 14.5 ft high, 21.75 ft wide, and 50 ft long test section. A schematic of the tunnel circuit is shown in Fig. 3. When testing in the closed-wall configuration, a maximum freestream velocity of 338 ft/s and a dynamic pressure (q_∞) of 144 psf can be achieved. The unit Reynolds number ranges from 0 to 2.2×10^6 per foot. The 14x22 test section floor has a boundary-layer removal system (BLRS) [35] located at its entrance (see the lower right image of Fig. 4). It was used to reduce the size of the tunnel floor boundary layer at the test section entrance. However, other than a few preliminary runs during the initial tunnel checkout phase, the BLRS was not used for the current test.

Most of the current tests were performed at a freestream Mach number (M_∞) of 0.2 and a corresponding q_∞ of approximately 60 psf. The turbulence intensity, which varies with dynamic pressure and test section location, is between 0.07% and 0.08% at a dynamic pressure of 60 psf [36]. A few lower speed runs were made at M_∞ of 0.175, 0.150, and 0.125. The following four subsections provide descriptions of (A) the CRM-SHL-AFC model, (B) the AFC actuators, measurements, and control, (C) the layouts of pressure taps and unsteady pressure transducers (Kulites®), and (D) the measurement uncertainty and wall correction method.

B. CRM-SHL-AFC Model

A semispan (right wing) CRM-SHL-AFC model was fabricated and tested in the landing configuration. A picture and two sketches of the model in the 14x22 are shown in Fig. 4. The 10%-scale model was installed on top of a 3.5-inch peniche (left image of Fig. 4), and as a result, the model and its peniche covered 68% of the tunnel span in the vertical direction. The model fuselage is 20.59 ft in length; therefore, it extended past the turntable and past the end of the model cart (right image of Fig. 4). The peniche is nonmetric and attached to the turntable, whereas the fuselage is metric and connected to the force balance below the model. A labyrinth seal provided the interface between the fuselage and the peniche.

Model Components and Features

The high-lift model has a half-body fuselage, a semispan wing, a set of 30º inboard and outboard slats, an engine nacelle/pylon, and a set of simple-hinged flaps with 50° and 55° deflections on the inboard and outboard, respectively. The outboard flap deflection was higher, but necessary to align the outboard edge of the inboard flap with the inboard edge of the outboard flap.

Key model components such as the slats, wing under slat surface (WUSS), wing trailing edge (spoiler), wing outboard region (aileron) beyond the outboard flap, wingtip, and flaps are all modular and replaceable/interchangeable. There are 3 inboard and 12 outboard slat brackets to hold the inboard and outboard slats in position, respectively. As intended, there were no external flap brackets for the AFC-enabled simple-hinged flaps, as shown in the left image of Fig. 4. The model spar is hollow to allow for routing of instrumentation and AFC plumbing. A wing/fuselage strake was installed on the CRM-SHL-AFC to represent a typical transport airplane (Fig. 5). All model surfaces have a finish of 32 microinches. The model was tested without any boundary-layer transition tripping tripping and the transition location was not documented. Correct scaling and simulation of boundary layer flows over three-dimensional swept high-lift wings are strongly dependent on the type and location of transition [37]. Since transition location was not measured, model surface finish (32 microinches) and freestream turbulence levels (0.07%–0.08% at q_∞ = 60 psf) of the facility are provided.

Model Reference Parameters

Key model geometric reference parameters are:

- Mean aerodynamic chord (c_{MAC}) = 27.6 inches at y = 46.9 inches (η = 0.41)
- Wing semispan (b) = 115.7 inches
- Reference area of the semispan model (S) = 2,973 in^2
- Aspect ratio = 9
- Sweep angle of the wing quarter chord = 35°
- Moment reference center (MRC): x = 132.6 inches, y = 0 inches, z = 17.8 inches
- Fuselage nose location: x = 9.3 inches, y = 0 inches, z = 19.8 inches
- Based on mean aerodynamic chord, $Re_{MAC} \approx 3.3\times10^6$ for the landing configuration at M_∞ = 0.20
- Wing dihedral angle: 5°
- Wing twist = 6.72° at η = 0; wing twist = -3.75° at η =1

Conventional CRM-HL

A conventional CRM-HL configuration with a set of 37° inboard and outboard single-element Fowler flaps was also built and tested for the purpose of comparison [23–30]. The modular approach provides flexibility and enables the model to be switched between the AFC-enabled simple-hinged flap (CRM-SHL-AFC) and the conventional (CRM-HL) high-lift configurations. The slats, the WUSS, and the center spar (i.e., almost 70% of the forward cruise chord) remain the same for both high-lift configurations, as the current study focused on the trailing-edge flow separation control. Cross section views of both configurations across the midoutboard flap location are illustrated in Fig. 5.

C. AFC Actuators, Measurements, and Control

Ten cavities (or chambers) are located on the shoulder region of the hinged flaps to enable the installation of four interchangeable AFC cartridges on the inboard flap and six on the outboard flap (see Fig. 6(a)). The 10 cartridges are enumerated in sequential order, where the most inboard cartridge is designated as C1 and most outboard one is designated as C10.

AFC Actuators

Two rows of AFC actuation are implemented for enhanced flow-control authority to address the strong adverse pressure gradient associated with the high deflection angles (≥50°) of the simple-hinged flap. Row 1 is the upstream row at the hinge line (forward tangent line) of the simple-hinged flap shoulder and Row 2 is downstream, near the aft tangent line of the flap shoulder. The selection of these two locations is derived from the lessons learned by Melton et al. [15] for applying a single row of sweeping jets on the shoulder of a highly deflected (60°) flap. The study indicated that one row of jets at the upstream shoulder tangent location is insufficient to overcome flow separation caused by a strong adverse pressure gradient. This led to the two-row AFC concept with jets located at both tangents of the flap shoulder. The three types of AFC devices examined are the Double-Row Sweeping Jets (DRSWJ) [24], the Alternating Pulsed Jets (APJ), and the High Efficiency Low Power (HELP) actuators [23,27,28]. The jet exit nozzles of these three actuator types are located at the same chordwise location for both rows. These actuator cartridges are illustrated in Fig. 6(b).

The geometric design of each sweeping jet inside the DRSWJ cartridge is similar to those of the Mod 2 geometry as reported by Melton et al. [16]. The actuators are arranged inline between the two rows. The APJ actuation is a new actuator design based on rotating the sweeping jet actuator 90° along its longitudinal axis and including a flow diverter/splitter at the jet exit. The inclusion of the diverter/splitter introduces a left and right side duct to the actuator when mounted horizontally, eliminating the sweeping motion of the jet and routing the flow to either duct. Rotating the actuator 90° enables exiting jets to pulse alternatingly, but not synchronously, between Rows 1 and 2. The APJ actuators generate pulsed jets through internal fluid dynamics without the use of any electromechanical moving parts. The DRSWJ and APJ actuator configurations were evaluated experimentally because the unsteady excitation produced by the two concepts is typically more efficient in terms of massflow. The data will be beneficial in understanding and improving the effectiveness of the actuator when used in flowfields with large adverse pressure gradients.

The HELP actuation is a new and promising approach that is a combination of unsteady sweeping jet blowing for Row 1 and steady discrete jet (STJ) blowing for Row 2 [23,27,28]. Lin et al. [28] reported that the new actuator design enabled the sweeping jet actuators of Row 1 to emit a significantly smaller amount of mass flow than that of the discrete jets of Row 2, and to "precondition the boundary layer" such that the Row 2 actuators can achieve much better flow control authority (i.e., enable the flow to follow the drastic change in surface direction between the main element and the flap). The intended goal of the boundary-layer preconditioning is to attenuate the effects of the surface curvature and the adverse pressure gradient at the flap shoulder. The Row 1 sweeping jet devices used in the HELP actuators have the same design as those used in the DRSWJ.

Figure 7 shows an example of the frequency characteristics of the eight sweeping jet actuators in Row 1 of the HELP Cartridge 1 (C1). The results were obtained from benchtop measurements of the actuator output using an unsteady pressure probe positioned at the actuator exit. The oscillating frequency of the jets increased with increasing nozzle pressure ratio (NPR). The figure shows an average oscillating frequency of around 900, 1050, and 1110 Hz for an NPR of 1.5, 2, and 2.5, respectively. The oscillating frequency is slightly higher for the outboard flap actuators (C5–C10) where the jet nozzles and AFC cartridges are a little smaller than those of the inboard flap. Note that the sweeping jet nozzles of the outboard flap have dimensions of 0.05-inch height by 0.08-inch width, whereas the sweeping jet nozzles of the inboard flap have dimensions of 0.06-inch height by 0.12-inch width.

The HELP actuators leverage the synergistic benefit of two rows of actuators acting together to produce a total aerodynamic lift that is greater than the sum of each row acting individually, as shown in Fig. 8 [28]. This synergy is much more pronounced at higher angles of attack where the adverse pressure gradient is stronger. By design, the sweeping jets in Row 1 discharge a small amount of the mass flow to enable the discrete jets of Row 2 to have greater flow control authority, effectively boosting the Coandă effect. The HELP actuation is aimed to expand the range of flow separation control in the "linear region" of the C_L versus $\dot{m}$ curves as illustrated in Fig. 2, which would also make the actuation highly efficient.

AFC Measurements, Parameters, and Control

The total mass flow rate of the AFC system was measured by a Coriolis flowmeter and a thermal mass flowmeter, which could measure flow rates up to ~0.8 lbm/s and 2 lbm/s, respectively. Each actuator cartridge's plenum pressure and temperature were measured as well. There were five control valves on a pressure manifold inside the model fuselage and each valve controlled a pair of hoses for supplying pressurized air to the ten AFC cartridges. The plenum pressure and mass flow rate for the cartridges could be varied by the control valves and/or by individual actuator nozzle exits being physically sealed (plugged).

The AFC test parameters investigated include actuation type (i.e., DRSWJ, APJ, and HELP actuators), mass flow rate (up to 1.3 lbm/s), nozzle pressure ratio (up to 3), and actuation coverage and spacing. About twenty flow control configurations were tested. See Table 1 for the complete list of the configuration designation and the associated run number and descriptions. Notice that the appearance of "^" at the end of the configuration name for run numbers greater than 100 designates data taken with a higher flow rate (thermal mass) flowmeter. It should also be noted that the waviness in the lift curves that will be presented for the HELP actuation was due to unsteadiness in the supply air control system that was running at the boundary of its operating envelope. The unsteadiness was also present with the other actuator configurations but the data acquisition procedure was modified to minimize the influence of the low frequency oscillations of the supply air system on the force and moment data (i.e., eliminate the jitter).

Vortex Generators

Passive flow control devices in the form of vortex generators were applied to the model using double-back tape for select runs. Corotating VGs were added near the flap shoulder on the HELP actuator cartridges upstream of the Row 1 sweeping jet (Fig. 9). Various combinations of passive and active flow control were evaluated (see Table 2). VGs were added to the leading edge of the model on the slatless WUSS as shown in Fig. 10 for select runs. The slatless WUSS is the region, along the wing span, downstream of the nacelle where the slat is not present to accommodate the presence of the nacelle. A summary of the runs that include VGs on the slatless WUSS is provided in Table 3.

D. Layouts of Pressure Taps and Unsteady Pressure Transducers

There were 550 static pressure taps on the wing, 56 on the fuselage, and 63 on the nacelle for a total of 669 taps on the model. There were 25 unsteady pressure transducers with 12 on the simple-hinged flap, seven on the pylon, and six on the wingtip.

Static Pressure Taps

Schematics of the pressure tap locations, indicated by red circular dots, are shown in Fig. 11. Most of the pressure taps on the high-lift wing are in streamwise arrays at eight spanwise locations (buttlines) with three rows across the inboard flap span, three rows across the outboard flap span, and two rows across the aileron region (i.e., based on the stowed coordinates, $\eta = 0.15, 0.24, 0.33, 0.42, 0.55, 0.69, 0.82$, and 0.91). Note that the Yehudi break that separates the inboard and outboard flaps is located at $\eta = 0.37$. There are 6 pressure taps near the wing tip. Six spanwise arrays are on the upper wing surface with one row on the slat, three rows on the main wing, and two rows on the flap (Fig. 11(a)).

The pressure taps on the fuselage cover streamwise rows at 3 different heights (water line locations) and circumferential rows at 6 fuselage stations around the wing root, as shown in Fig. 11(b). Additionally, the pressure taps on the nacelle cover 4 streamwise rows on both the interior and exterior of the nacelle at 0°, 90°, 180°, and 270° (facing downstream) at $x \approx 99.8$ inches. Pressure taps are located on an exterior circumferential row covering 180° of the nacelle upper surface (between 0° and 270°) at $x \approx 99.8$ inches, on a circumferential row covering 360° of the interior inner nacelle surface at $x \approx 106.6$ inches, and on the pylon at $x = 109.2$ inches (Fig. 11(c)).

The measured pressure tap coordinates for the main element (ME) of the wing and the (adjustable) slats in the stowed position are listed in Table A1 under Appendix A. The pressure tap coordinates for the nonadjustable (fixed) simple-hinged flaps in the deployed position, the fuselage, and the nacelle are listed in Tables A2, A3, and A4, respectively, in the same appendix. The associated datafile channels and bad pressure ports are identified in these tables as well.

Unsteady Pressure Transducers

Schematics of the unsteady pressure transducer locations, indicated by blue circular dots, are shown in Fig. 12. The purpose of these sensors is to detect flow separation and/or vortex shedding on the inboard and outboard flaps, as well as over the pylon and wingtip. The diameter of these transducers is 0.062 inches and they were mounted flush with the model surface.

There are 2 spanwise rows of unsteady pressure transducers across the upper surface of the inboard and outboard flaps. One row (six even channels: Ch0–Ch10) located immediately downstream of the AFC cartridges and the other row (six odd channels: Ch1–Ch11) located near the flap trailing edge. Sensor locations on the simple-hinged flaps with close-up views displaying their position relative to the actuator cartridges are shown in Fig. 12(a).

There are 7 unsteady pressure transducers on either side and on top of the pylon (Ch18–Ch24) and 6 more located at the wingtip in the chordwise direction (Ch25–Ch30), as shown in Figs. 12(b) and 12(c), respectively. The sensors installed on the pylon and wingtip were mainly in support of aeroacoustics simulations described by Lockard et al. [36]. The prescribed unsteady pressure sensor coordinates are listed in Table A5 under Appendix A. The associated data file channel numbers and bad transducers are identified in the table as well.

E. Measurement Uncertainty and Wall Correction

The experimental measurements made during the test include forces and moments using the NASA MC-110 balance, AFC mass flow rate using a mass flowmeter, AFC cartridge plenum pressures and surface static pressures using pressure taps and electronically scanned pressure (ESP) modules, and surface pressure fluctuations using unsteady pressure transducers.

Data Uncertainty

Based on the balance accuracy, angle of attack (α) and dynamic pressure (q_∞), the expected instrumentation uncertainty is estimated to be ±0.007 to ±0.008 for the lift coefficient (C_L), ±0.0022 to ±0.0036 for the drag coefficient (C_D), and ±0.004 for the pitching moment coefficient (C_m). The uncertainty of the first two is also a function of α (i.e., a greater uncertainty is associated with higher angles of attack). These trends will be presented along with the data repeatability results in the repeatability section.

Wall Correction

The primary data presented in this paper was corrected for the presence of the tunnel walls using the Transonic Wall Interference Correction System (TWICS) method [31–33]. The wall correction method uses measured wall pressures and accounts for the solid body blockage, separation wake blockage, and lift interference correction for a semispan model. The application of the TWICS correction typically increased the angle of attack for the lift curve by 0.2° to 1.2° and decreased the maximum lift coefficient by ~0.01 to 0.06 [27].

Note that the CRM-HL and CRM-SHL-AFC test results presented in Refs. [23–26] had no wall correction applied, and the CFD results reported in Refs. [29,30] used the test data without the wall correction for comparison because tunnel walls were simulated in the predictions. However, the CRM-HL and CRM-SHL-AFC test results presented in Refs. [27,28] had the TWICS wall correction method applied.

Results and Discussion

The main goal of the test campaign was to develop an AFC system that can provide $\Delta C_L \geq 0.5$ on a simple-hinged flap high-lift system while minimizing its pneumatic power requirement. A total of 83 test runs were made on the CRM-SHL-AFC that involved about 20 AFC configurations covering different actuator types (i.e., HELP, DRSWJ, and APJ actuators). Various configurations were tested in an attempt to reduce the mass flow usage of the AFC actuators. These configurations include reducing the number of actuating cartridges to fewer than 10 (i.e., partial spanwise coverage), sealing selected sweeping jet nozzles, and/or applying more pneumatic power to inboard cartridges than the outboard ones using a spanwise tailoring (ST) of NPR approach in which NPR is reduced along the outboard wing section.

Table 1 summarizes the AFC configurations and their associated designation. All test runs are summarized in Tables 2, 3, and 4 for HELP (55 runs), DRSWJ (24 runs), and APJ (4 runs) actuators, respectively. The corresponding figure numbers and aerodynamic data table numbers are also provided in these tables. The wind tunnel test results and discussion are presented in the following four subsections: (A) aerodynamic results, (B) pneumatic power usage, (C) static surface pressure data, and (D) unsteady surface pressure data. The first two subsections present the results from all or almost all runs. The latter two subsections present select data comparing the surface static pressure and autospectral density, respectively, for the AFC-off case and the best HELP actuation case at 8.9° and 17.1° (near stall).

A. Aerodynamic Data

The aerodynamic performance data with the TWICS corrections for all CRM-SHL-AFC test runs at the landing configuration (i.e., 30° slat deflection and 50°/55° inboard/outboard simple-hinged flap deflections) are tabulated in Table B1 to B83 under Appendix B. Appendix C contains all corresponding data to Appendix B without the wall correction (i.e., Table C1 to Table C83). All aerodynamic test results with the wall correction (TWICS) are presented in the following discussion and are shown as C_L, C_m, and C_D versus α plots in Figs. 13 to 30. For reference, the corresponding aerodynamic plots without the wall correction are also provided in Figs. D1–D18 under Appendix D.

Notice that the drag data are not corrected for the thrust produced by the AFC actuators. The consensus is that the virtually negligible amount of thrust from the actuators should not be artificially removed because it is the actual force exerted on an airplane with AFC applied.

Preliminary Runs: Hysteresis and Floor BLRS effects

A few preliminary test runs were made during the initial tunnel checkout phase prior to the sealing of several camera window openings and the completion of model surface prepping for testing, i.e., missing filler and joints not yet taped. These runs are used to examine the effects due to hysteresis for changing angle of attack and activation of the floor boundary layer removal system (BLRS).

Hysteresis effects associated with increasing and decreasing angle of attack (Runs 45 and 46, respectively) are shown in Fig. 13. The results indicate little or no hysteresis in the lift, pitching moment, and drag curves. Figure 13 also includes the aerodynamic results for a run with the floor BLRS activated (Run 47). The results indicate little or no difference due to the BLRS on the pitching moment and drag curves. However, there is a slight increase in lift for $\alpha \geq 8°$. The small lift difference was not of any particular concern because it could be due to a slightly higher inflow through the opening in the camera windows on the tunnel sidewall caused by the activation of the BLRS. Because of the desire to minimize BLRS-generated noise, the rest of the test was performed without the floor BLRS activated, so the small difference was not a concern.

Repeatability (AFC-Off Case)

After the sealing of the camera window openings, Run 52 is considered the first official run of the test. There were 7 repeat runs (Runs 52, 54, 74, 117, 134, 147, and 172) made for the AFC-off case for the CRM-SHL-AFC test campaign. This was done to quantify any unknown variations in the model or tunnel setup as the test progressed. These repeat runs also provided an opportunity to assess the variability of the data. Figure 14 shows the aerodynamic plots (lift, pitching moment, and drag coefficients versus angle of attack) for these runs with TWICS applied. Note that Run 52 was done with the actuator cartridges sealed (covered with tape), and Run 172 (red dotted line) represent the last run at the conclusion of the test. In general, the repeatability seems to be excellent with little or no variations. The C_m is negative for all angles of attack until stall, which indicates the wing pitches in the nose-down direction, which is consistent with a typical high-lift wing [39]. As expected, the C_D increased as the angle of attack increased.

For a closer examination, Fig. 31 shows variations in ΔC_L, ΔC_m and ΔC_D as a function of α for the 7 AFC-off repeat runs. All differential values were calculated with respect to the corresponding average values of these repeat runs. The variations in ΔC_L were well within the measurement uncertainty of ±0.007 to ±0.008 for most of the angles of attack, except a marginal outlier at the lowest angle of attack (i.e., α = -3.85° for Run 54). The variations in ΔC_m were also within the measurement uncertainty of ±0.004 for most angles of attack, except $\alpha > 17°$ (post stall). Variations in ΔC_D were larger than the expected measurement uncertainty for the lower angles of attack and more in-line with the expected measurement uncertainty for the higher angles of attack. Since there is negligible difference between these repeat runs, an AFC-off run that was closest to its corresponding AFC runs is chosen for comparison in the following discussion. For example, Run 117 (AFC-off) is compared to Run 109 (AFC-on) in a later section.

HELP Actuation: Partial Coverage or Nozzle Blockage

The aerodynamic results of partial spanwise HELP actuation coverage using 4 or 6 cartridges (HELP-4C, HELP-6C) are shown in Fig. 15. The HELP-4C configuration consisted of activating only the 4 most inboard cartridges (Runs 61 and 62: C1–C4), whereas the HELP-6C configuration consisted of either activating the 6 most inboard actuators (Run 63: C1–C6) or activating the 4 cartridges for the inboard flap plus the middle pair of cartridges of the outboard flap (Run 64: C1–C4 plus C7–C8). The results show that the HELP-4C configuration was able to produce $\Delta C_L \approx 0.2$ and 0.3 at NPR of around 1.5 and 2.2, respectively. The HELP-6C configuration was able to provide $\Delta C_L \approx 0.35$ at NPR of 2, with the continuous coverage case (Run 63) performing slightly better than the noncontinuous case (Run 64). The higher lift typically resulted in more negative (nose-down) pitching moment and higher drag. The noncontinuous case of 6-cartridge actuation provided the most nose-down pitching moment, even though it did not produce the most lift. This is due to the locations of Cartridges 7 and 8 (C7–C8), which were farther downstream on the swept outboard flap (providing a larger moment arm).

Figure 16 shows the aerodynamic plots of partial HELP actuation coverage using the 8 most inboard cartridges (C1–C8: HELP-8C and HELP-8C^). For run numbers greater than 100, the mass flow was measured with a thermal mass flowmeter (configuration designation ending with ^). The configuration with NPR ≈ 2.5 (Run 113) was able to produce $\Delta C_L \approx 0.5$ over the entire lift curve, which was the lift performance goal of the research effort. Again, the amount of increase in nose-down pitching moment and drag is a direct function of lift increment. All C_m curves have positive slopes between $\alpha \approx 0°$ and $\alpha \approx 19°$.

The aerodynamic curves of the HELP actuator cartridges with their Row 1 actuators/jets/nozzles (sweeping jets) sealed or partially sealed are shown in Fig. 17. The HELP-10C-R1S configuration consisted of sealing all the sweeping jet nozzles in Row 1, whereas the HELP-10C-R1ENS configuration was created by sealing only the even number (every other) sweeping jet nozzle in Row 1. Figure 17 indicates that sealing off Row 1 reduces the flow control authority at higher angles of attack. This reduction is noticeable when comparing the slopes of the lift curves of Runs 77 and 78 to that of the AFC off case of Run 74. Activating the Row 1 sweeping jets is essential in maintaining the lift increment for the entire angle of attack range. Even with the activation of only every other nozzle in Row 1, the actuation was sufficient to maintain the lift increment at higher angles of attack (Runs 80 to 82).

To explore the possibility of whether the sweeping jets in Row 1 could be substituted with passive flow control devices, a row of 79 corotating vortex generators (VGs) were installed upstream of the Row 1 sweeping jets, as shown in Fig. 9. Each VG has a height of 0.2 inches and a length of 0.75 inches. They are the same kind of VGs reported by Koklu [40]. The leading edge of the VGs was aligned with the leading edge of the AFC cartridge and oriented 16° in the outboard direction. Comparing the VG-off cases of Runs 77 and 78 (HELP-10C-R1S) in Fig. 17 to the VG-on cases of Runs 86 and 87 (HELP-10C-R1S+R1VGs) in Fig. 18, it is observed that adding VGs to an inactivated Row 1 could improve the lift slightly, but not nearly as much as if Row 1 is activated with sweeping jets (Run 71: HELP-10C). Adding VGs to the Row 1 sweeping jet actuation (Run 89: HELP-10C+R1VGs) does not provide any additional lift enhancement; on the other hand, it seems to slightly reduce the lift for $\alpha > 7°$.

HELP Actuation: Full Coverage

The aerodynamics results of full spanwise HELP actuation coverage using 10 cartridges (HELP-10C) at NPR ≤ 1.7 are shown in Fig. 19. Note that NPR = 1.8929 corresponds to the choked flow condition. The HELP-10C configuration was able to provide $\Delta C_L \approx 0.4$ at an NPR range of 1.5 to 1.7. The spanwise NPR tailoring case (Run 72: NPR = 1.7) produced slightly more lift than the constant blowing case (Run 71: NPR = 1.5) for $\alpha \leq 12°$. However, the small advantage in lift increments disappeared at higher angles of attack.

Figure 20 shows results for full spanwise HELP actuation coverage using 10 cartridges (HELP-10C^), whereas Fig. 21 compares some of these same runs with their corresponding repeat runs. The full-coverage HELP actuation with NPR ≥ 2 appears able to achieve the lift performance goal ($\Delta C_L \geq 0.5$) at the lower angles of attack and came very close to reaching the performance goal near maximum lift. The AFC-induced ΔC_L increment was maintained for the entire lift curve that includes both lower angles of attack (e.g., $\alpha \approx 9°$) and near maximum lift (i.e., $\alpha \approx 17°$) for most cases examined. The significant increase in the lift increment reduced the stall angle by up to 3° (from $\alpha \approx 19.5°$ to 16.5°). The AFC cases repeat reasonably well. Note that Runs 103 and 109 are not true repeat runs because the former has a significantly lower NPR for $\alpha \leq 9°$ (see Tables B43 and B48).

Full-coverage HELP actuation (HELP-10C^) with NPR ≈ 2.5 provided the best lift performance increase for the entire angle of attack range and fulfilled the lift enhancement goal. The best lift-enhancement case (Run 109) generally produced slightly lower drag for the same lift. It should be noted that the increase in drag without losing lift for the landing configuration could be desirable whenever a substantial speed reduction of the aircraft is required, such as during the landing approach. The best-case HELP actuation (liftwise) produced the most amount of negative C_m. A negative C_m (or nose-down pitching moment) helps to maintain aircraft longitudinal stability.

One additional approach was explored in an attempt to reduce the mass flow usage of the HELP actuators by applying more pneumatic power over the inboard flap than over the outboard flap using a spanwise tailoring (ST) of the NPR approach (HELP-8C-ST^ and HELP-10C-ST^), as shown in Fig. 22. Typically, NPR is higher than its averaged value for the inboard flap (C1–C4) and less than its averaged value for the outboard flap (C5–C10). Figure 22 shows that this approach (Runs 114 to 117) also met our targeted lift performance goal at the lower angles of attack and came very close to reaching the performance goal near maximum lift.

HELP Actuation: Lower M_∞

Several runs were made at lower M_∞ to examine the effects of increasing the momentum coefficient (C_μ) without increasing the pneumatic power (i.e., NPR). Figure 23 shows the aerodynamic plots at M_∞ = 0.15 for NPR < 2. The results of the AFC-off case (Runs 66 and 93) repeat well. At this lower M_∞, full-coverage actuation (HELP-10C) with NPR = 1.5 or eight-cartridge partial coverage (HELP-8C) NPR ≥ 1.75 could produce $\Delta C_L \approx 0.5$ over the entire lift curve, as shown in Fig. 23. The C_μ for these cases are greater than ~0.03 (i.e., Run 67: Table B14; Run 94: Table B36), which is about the same C_μ as those for the M_∞ = 0.20 cases that produced $\Delta C_L \approx 0.5$ (i.e., Run 110: Table B49; Run 113: Table B51).

Figure 24 shows the aerodynamic plots at M_∞ = 0.125 and M_∞ = 0.175 for NPR ≤ 1.5. The variation in M_∞ (and Re_{MAC}) is relatively small, with the exception of a slightly higher drag coefficient for the M_∞ = 0.125 case (Run 90). The full-coverage configuration (HELP-10C) with NPR = 1.5 produced $\Delta C_L \approx 0.4$ with $C_\mu \approx 0.023$ (Run 95: Table B37) at M_∞ = 0.175, whereas the same NPR could produce $\Delta C_L \approx 0.55$ with $C_\mu \approx 0.04$ (Run 92: Table B34) at M_∞ = 0.125.

DRSWJ Actuation: Partial Coverage or Nozzle Blockage

The aerodynamic curves for the DRSWJ actuators with various nozzles sealed are shown in Fig. 25. The DRSWJ-10C-R2S^ configuration consisted of sealing all sweeping jet nozzles in Row 2, whereas the DRSWJ-10C-R2S+R1ENS^ consisted of sealing all sweeping jet nozzles in Row 2 plus only the even number (every other) sweeping jet nozzles in Row 1. Figure 25 indicates that sealing off Row 2 (or activation of Row 1 sweeping jets only) produced $\Delta C_L \leq 0.1$ at lower angles of attack, however, this lift increment range increased to $\Delta C_L \leq 0.15$ at higher angles of attack.

Figure 26 shows the aerodynamic results for the DWSWJ-10C-ENS^ configuration that consisted of sealing all even nozzles on both Row 1 and Row 2 sweeping jet nozzles. This configuration was able to provide $\Delta C_L \approx 0.15$ at an NPR of 2.5.

DRSWJ Actuation: Full Coverage

The aerodynamic results of full-coverage DRSWJ actuation (DRSWJ-10C^) at various NPR levels are shown in Fig. 27. As expected, the lift increment increases as the NPR increased. The DRSWJ-10C^ configuration was able to produce $\Delta C_L \approx 0.35$ at an NPR = 3. The AFC-induced ΔC_L increment was maintained for the entire lift curve. There seems to be a slightly better lift increment at higher angles of attack than those of the lower ones. The case with NPR = 1.5 repeats very well.

DRSWJ Actuation: Lower M_∞

Figure 28 shows the aerodynamic plots of full-coverage DRSWJ actuators (DRSWJ-10C^) at M_∞ = 0.15 for NPR of 1, 1.5, 2, and 3. At this lower M_∞, the DRSWJ-10C^ configuration at NPR = 3 was able to produce $\Delta C_L \approx 0.5$ over the entire lift curve. The C_μ for this case is ~0.017 (i.e., Run 170: Table B81), which is significantly smaller than that of the HELP actuator case at M_∞ = 0.15 that produced $\Delta C_L \approx 0.5$ with a C_μ ~ 0.031 (i.e., Run 94: Table B36).

APJ Actuation

Figure 29 shows the aerodynamic results of full-coverage APJ actuators (APJ-10C^) for NPR of 1, 1.5, 2, 2.5, and 3. The APJ-10C^ configuration at NPR = 3 was able to produce $\Delta C_L \approx 0.27$ over the entire lift curve. The C_μ for this case is ~0.012 (i.e., Run 165: Table B78).

Vortex Generators on Slatless WUSS

To explore the possibility of whether the nacelle vortex system and/or the streamwise vortices from the slat side edges around the pylon could be controlled by passive flow control devices, a row of 7 corotating VGs were installed on the slatless WUSS region just downstream of the pylon, as shown in Fig. 10. These are the same type of VGs described previously in this paper. Figure 30 shows that there is no significant difference between the aerodynamic curves due to the installation of the VGs.

Koklu et al. [26] demonstrated that a nacelle chine could generate flow-field scale streamwise vortices that control the flow separation downstream of pylon near maximum lift. However, the size of the current boundary-layer scale VGs might be too small and perhaps in the wrong location (i.e., engulfed within the nacelle vortex system near the maximum lift) to have any effect.

B. Pneumatic Power Usage

Two angles of attack, α = 8.9° in the linear region of the lift curve and α = 17.1° near maximum lift, were selected to compare pneumatic power usage requirements. Note that 8.9° and 17.1° angles of attack are equivalent to 8° and 16°, respectively, without the tunnel wall corrections applied.

Nozzle pressure ratio (NPR), mass flow rate, momentum coefficient, and power coefficient are the parameters used to assess the pneumatic power usage of the AFC configurations in the following subsections.

The lift of the reference CRM-HL, defined in Refs. [23,27,28] as the conventional CRM-HL configuration with the engine nacelle and nacelle chine, is also plotted in the figures of this subsection as a dotted line to represent the lift performance goal. The targeted lift values are C_L = 1.8754 at α = 8.9° and C_L = 2.4476 at α = 17.1°. Because of the Fowler flap effect, the reference CRM-HL lift curve has a slightly steeper slope compared to those of the CRM-SHL-AFC configurations, which means a slightly larger lift increment (ΔC_L) is needed at higher angles of attack.

Nozzle Pressure Ratio

Figures 32 and 33 show the effects of NPR on lift for the AFC configurations investigated at α = 8.9° and α = 17.1°, respectively. Based on the NPR input and the resulting lift performance at the two angles of attack, full-coverage HELP actuation with 10 cartridges (HELP-10C^, HELP-10C, HELP-10C-ST^, HELP-10C-ST) is more efficient than any partial coverage, blocked nozzle, DRSWJ, or APJ cases examined. The least effective case is the DRSWJ actuators with both Row 2 and even nozzles of Row 1 sealed (DRSWJ-10C-R2S+R1ENS^) as it has the smallest total nozzle area.

Although several cases using partial coverage (8 cartridges) or full coverage (10 cartridge) with spanwise tailoring (ST) of NPR were able to match or exceed the lift target of the reference CRM-HL with

NPR > 1.8 at $\alpha = 8.9°$ (Fig. 32), their lift performance was slightly below (i.e., within 0.05 ΔC_L) the goal near the maximum lift at $\alpha = 17.1°$ (Fig. 33).

The full span coverage of the HELP actuation (HELP-10C^) with a constant spanwise NPR is the most effective because it is the only AFC case that achieved the lift enhancement goal near stall ($\alpha = 17.1°$), as shown in Fig. 33. Therefore, it is considered the best AFC case. For the best-case HELP actuation (Run 109), an NPR greater than 1.8 is needed to achieve the lift enhancement goals for $\alpha = 8.9°$ (Fig. 32) and an NPR greater than 2.25 is needed for $\alpha = 17.1°$ (Fig. 33).

Mass Flow Rate

Another important AFC parameter examined is the mass flow rate ($\dot{m}$). Figures 34 and 35 present the effects of mass flow rate on lift for the AFC configurations investigated at the selected angles of attack of 8.9° and 17.1°, respectively. The C_L versus $\dot{m}$ curves roughly collapsed into a single curve for all AFC cases and remained fairly linear (a sign of good actuation efficiency) at $\alpha = 8.9°$ and to a lesser extent at $\alpha = 17.1°$.

Based on the mass flow rate input and the resulting lift performance at the two angles of attack, DRSWJ actuators (DRSWJ-10C^) were most efficient for $\dot{m} < 0.6$ lbm/s and $\Delta C_L \leq 0.32$. DWSWJ actuators with every second nozzle sealed for both rows (DRSWJ-10C-ENS^) could also be very efficient for $\dot{m} < 0.3$ lbm/s and $\Delta C_L \leq 0.15$. HELP actuation with the activation of the 4 inboard cartridges (HELP-4C) was also very efficient at $\alpha = 8.9°$ but less so at $\alpha = 17.1°$. In terms of mass flow rate versus lift enhancement efficiency, the spanwise tailoring of NPR that emphasizes more inboard blowing performed like the untailored case (constant spanwise NPR) at both angles of attack.

For the best-case HELP actuation, a mass flow rate of greater than ~0.91 lbm/s ($C_Q = 0.0027$) is needed to achieve the lift enhancement goal at $\alpha = 8.9°$ (Fig. 34), whereas a mass flow rate of greater than ~1.23 lbm/s ($C_Q = 0.0036$) is needed to achieve the lift enhancement goal at $\alpha = 17.1°$ (Fig. 35).

Momentum Coefficient

The momentum coefficient (C_μ) is a parameter that has been used for scaling the performance of AFC actuators [20]. Figures 36 and 37 present the effects of C_μ on lift for the AFC configurations investigated at the selected angles of attack of 8.9° and 17.1°, respectively. The C_L versus C_μ curves somewhat resemble those of the C_L versus $\dot{m}$ curves. Therefore, based on the required C_μ and the resulting lift performance at the two angles of attack, the DRSWJ actuators (DRSWJ-10C^) were again judged most efficient for $C_\mu < 0.01$ and $\Delta C_L \leq 0.32$.

For the best-case HELP actuation, a C_μ of greater than ~0.025 is needed to achieve the lift enhancement goal at $\alpha = 8.9°$ (Fig. 36), and a C_μ of greater than ~0.037 is needed to achieve the lift enhancement goal at $\alpha = 17.1°$ (Fig. 37).

Power Coefficient

Lin et al. [23] suggested that the power coefficient (C_π) is a better parameter to use for judging the performance efficiency of AFC actuators. The C_π takes account of both the mass flow coefficient (C_Q) and the supply air pressure (i.e., NPR). It is linked to the power usage of a pneumatic-based AFC system as described by Seele et al. [12]. Figures 38 and 39 present the effects of C_π on lift for the AFC configurations investigated at the selected angles of attack of 8.9° and 17.1°, respectively.

Based on the required C_π and the resulting lift performance at the two angles of attack, the full-coverage HELP actuators (HELP-10C^) were judged most efficient for $C_\pi \geq 0.08$ and $\Delta C_L \geq 0.25$. Below these C_π and ΔC_L values, there were small differences between HELP-10C^ and DRSWJ-10C^ at $\alpha = 8.9°$ (Fig. 38); however, DRSWJ-10C^ seems to be slightly more efficient at $\alpha = 17.1°$ (Fig. 39).

For the best-case HELP actuation, a C_π of greater than ~0.18 is needed to achieve the lift enhancement goal at $\alpha = 8.9°$ (Fig. 38), and a C_π of greater than ~0.3 is needed to achieve the lift enhancement goal at $\alpha = 17.1°$ (Fig. 39).

Certain characteristics of the C_L versus C_π curves (Figs. 38 and 39) are somewhat similar to those of C_L versus C_μ curves (Figs. 36 and 37). Both curves roughly collapsed into a single curve for both $\alpha = 8.9°$ and $\alpha = 17.1°$, suggesting that C_π may be used for scaling up of a pneumatic-based AFC system such as the HELP actuation, because C_Q is scalable — and perhaps NPR too — from the system analysis and integration perspective.

C. Static Pressure Data

As a result of the aerodynamic data analysis, the AFC-off case (Run 117) and the best HELP actuation (Run 109; HELP-10C^ configuration with NPR = 2.5) were chosen for further comparison of surface pressures (Figs. 40 to 70). The pressure comparisons are shown for the high-lift wing, fuselage, and nacelle in the following subsections. The pressure distribution plots are presented at 5 angles of attack of $\alpha = 4.7°$, 8.9°, 13°, 17.1°, and 19.1° for the two CRM-SHL-AFC cases. At these corresponding angles of attack, the suction pressures are slightly higher without the wall correction, however, the ΔC_p due to the wall correction is typically less than 0.15. For clarity, an image showing the location of the pressure row marked by a red line accompanies each figure.

High-lift wing: streamwise

The streamwise surface pressure distributions across the 8 spanwise (butt line) locations plus the wingtip, corresponding to $\eta = 0.15$, 0.24, 0.33, 0.42, 0.55, 0.69, 0.82, 0.91, and 1.0, are shown in Figs. 40 to 48, respectively. Note that the pressure tap location in x is for the deflected coordinates, and the deflected y coordinates for the slats and flaps are not aligned with the freestream direction. The pressure tap locations on the flap shoulder are between AFC cartridges and are not aligned with the 8 spanwise η locations of the main element. However, the η locations shown in all inset images are based on the wing main element (or stowed) coordinates as the η locations/values are for illustration purposes only. The lower angle of attack cases ($4.7° \leq \alpha \leq 8.9°$) correspond to typical landing approach flight conditions, whereas $\alpha = 13°$, 17.1°, and 19.1°, correspond to typical prestall, stall, and post stall conditions, respectively. Generally speaking, as the angle of attack increased, the suction pressure on the leading edge of the slat and the main wing also increased, whereas the suction pressure on the leading edge of the flap decreased.

For the inboard flap locations of $\eta = 0.15$, 0.24 and 0.33 (Figs. 40, 41, and 42, respectively) as well as the outboard flap locations of $\eta = 0.42$, 0.55 and 0.69 (Figs. 43, 44, and 45, respectively), the flow is mostly separated on the upper flap surface for the AFC-off case, as indicated by the flattened suction pressures at all six inboard and outboard flap locations. The best-case HELP actuation (AFC-on: Run 109) significantly reduced the flow separation on the flaps as indicated by the improved pressure recoveries on the inboard and outboard flaps. The AFC-induced increase in lift compared to the AFC-off case is evident by the significant increase in suction pressures on the upper surfaces of the slats, main wing and flaps. There is also an increase of AFC-induced positive pressure on all lower surfaces as the angle of attack increased. The increased ΔP between the upper and lower surfaces directly resulted in the significantly higher lift observed.

At the streamwise locations just downstream of the nacelle ($\eta = 0.33$), Fig. 42 indicates that the shapes of the streamwise pressure distributions on the wing leading edge are quite different from those at other spanwise locations. This is due to the slatless WUSS piece there (see Fig. 10). For the three inboard flap stations ($\eta = 0.15$, 0.24 and 0.33), the AFC-induced suction pressure increase near the flap hinge line is especially noticeable; and there is also evidence of flow separation toward the flap trailing edge for the AFC-on case at most angles of attack (Figs. 40 to 42). For the AFC-on case at stall and post stall conditions ($\alpha = 17.1°$ and 19.1°, respectively), the outboard slat at $\eta = 0.55$ and 0.69 had nearly twice the peak suction pressure as the slat at $\eta = 0.15$, 0.24, 0.33, and 0.42 (i.e., $C_p \approx -13.2$ and -15.4 in Figs. 44 and 45 versus -5.5 to -7.9 in Figs. 40 to 43), indicating a much higher flow circulation around these two outboard slat locations.

For the outboard wing or aileron locations ($\eta = 0.82$ and 0.91), Figs. 46 and 47 show that the increase in suction pressures remained fairly strong on the slat and the wing leading edge at all angles of attack for the AFC-on case, despite the fact that there is no flap or AFC at these spanwise locations to enhance the flow circulation. The pressure distributions and the minimal change in dC_p/dx indicate there could be a small amount of flow separation near the wing trailing edge at α = 17.1° and 19.1°. The streamwise pressure distribution for the wingtip location (η = 1.0) is shown in Fig. 48. Even with only 5 working pressure taps at the wingtip, the high suction pressures indicate the presence of a strong tip vortex at stall and post stall conditions (α = 17.1° and 19.1°, respectively). The AFC-induced suction peak pressure occurred at α = 19.1° (post stall), where $C_p \approx$ -11.6, -8.4, and -10 for η = 0.82, 0.91, and 1, respectively.

High-lift wing: spanwise

The spanwise surface pressure distributions along 6 chordwise locations across the mid-slat, wing leading edge, midwing, wing trailing edge upstream of flap shoulder, just downstream of AFC actuators, and flap/wing trailing edge, are shown in Figs. 49 to 54, respectively. For clarity, each figure includes a transparent planform image showing the location of the corresponding spanwise pressure row as a red line (based on stowed coordinates) and the relative location of key wing components. With the exception of the flap/wing trailing row, the AFC-on case shows a significant increase in the suction pressure across the span over the AFC-off case at all angles of attack (Figs. 49 to 53).

At the midslat row, the post stall (α = 19.1°) maximum spanwise suction pressure occurred at η = 0.56 for the AFC-off case and at η = 0.60 for the AFC-on case, as shown in Fig. 49. The effect of the nacelle is clearly shown in the C_p distributions for the midslat row and the wing leading-edge row (Figs. 49 and 50, respectively). For the wing leading-edge row, the drop in the suction pressure at $0.2 \leq \eta \leq 0.5$ is due to the slat cutout in this region required to integrate the nacelle/pylon and the reduced upwash due to the presence of the nacelle. As expected, higher angles of attack resulted in higher suction pressures on the midslat and wing leading-edge rows.

Figure 51 shows that the footprint of the nacelle vortex system is mostly dissipated by the midwing row, but the AFC-induced suction pressure increase persisted. At the midwing row, the increasing strength of the wingtip vortex as angle of attack increased is especially noticeable. Due the increased lift caused by the larger ΔP between the upper and lower surface of the wing, the AFC-on case also produced a stronger wingtip vortex than the AFC-off case. These pressure distribution trends are the same for the wing trailing edge spanwise row just upstream of the flap shoulder, however, the footprint of the nacelle vortex system seems to reemerge for $\alpha \geq 13°$, as shown in Fig. 52.

Spanwise surface pressures on the slat and the main wing indicate that the AFC-induced suction pressure increase extends all the way to the wingtip. The increase in spanwise suction pressures is especially notable on the slat and wing leading edge (Figs. 49 and 50), well past the η location of the outboard flap edge where AFC actuation ends.

To better identify any localized effects on the flaps, the locations of the Yehudi break and the outboard flap edge are indicated by dotted vertical lines in Figs. 53 and 54. The spanwise C_p distributions just downstream of the AFC actuators (Fig. 53) and at the trailing edge (Fig. 54) indicate that the flow over the flaps is much more three dimensional (3D) for the AFC-on cases than the AFC-off cases. The AFC-induced oscillation in the C_p distributions roughly matches the number of AFC cartridges (10) and their averaged pressure values are generally indicating more flow attachment on the flaps at all angles of attack with the exception of α=17.1° and α=19.1° for the inboard flap. These periodic 3D flow features (locally separated and attached flow regions) on the flaps were predicted by the CFD results [29,30] and confirmed by oil flow visualization [27].

Although the gaps between the AFC cartridges could not be eliminated due to model structural considerations, the AFC-induced partial flow attachment was still able to provide sufficient lift enhancement for the CRM-SHL-AFC to meet its performance goal. Beyond the outboard flap toward the wingtip, there are indications of flow separation near the wing trailing edge for both AFC-on and AFC-off cases for $\alpha \geq 17.1°$ (Fig. 54).

Fuselage

The streamwise pressure distributions for the fuselage water line locations of middle, upper, and lower rows (corresponding to z = 23, 32, and 10 inches) are shown in Figs. 55 to 57, respectively. Note that z = 32 and 10 inches share the same butt line location of $\eta = 0.06$. With the exception of the fuselage station near the nose, the z = 23 inches water line location corresponds to $\eta = 0.11$.

The streamwise pressure distributions at z = 23 inches (middle water line location) has the highest suction peak pressure at x = 106.4 inches, corresponding to the third tap from the leading edge of the wing root (Fig. 55). The AFC-on case also produced more suction pressure at all angles of attack compared to the AFC-off case, especially between x = 120 and 145 inches.

At z = 32 inches (upper water line location), the streamwise suction peak level reduced by almost half compared to the middle water line location. The peak location moved downstream to x = 121.2 inches, corresponding to the fourth tap from the leading edge of the wing root (Fig. 56). Similar to the middle water line location, the AFC-on case produces more suction pressure at all angles of attack compared to the AFC-off case, especially between x = 120 and 145 inches. The suction pressure increase at $\alpha = 19.1°$ (post stall) is particularly noticeable.

At $z \sim 9$ inches (lower water line location), the streamwise pressure distributions indicate increased positive pressure for the AFC-on case, especially near the wing root. This is opposite to what is observed for the middle and upper water line locations, as the flow passes underneath the wing root hump (Fig. 57). Because the fuselage also provides ~15% of the total lift, both the increase in suction pressures at the upper water line location and the increase in positive pressures at the lower waterline location contribute to the total lift increase of the high-lift system.

The circumferential pressure distributions on the fuselage around the wing root region at x = 99.7, 106.4, 132.5, 142.5, 149.5, and 156.5 inches are shown in Figs. 58 to 63, respectively. Again, the AFC-on case produces more suction pressure on the leeward side (near the upper water line) and more positive pressures on the windward side (in proximity to the lower water line) at all angles of attack compared to the AFC-off case.

Around the leading edge of the wing root hump, the first two circumferential pressure distributions at x = 99.7 and 106.4 inches both have a distinct suction peak at z = 20 (Figs. 58 and 59). The suction pressure levels reduce steadily at each succeeding fuselage station (x) moving toward the hump trailing edge (Figs. 60 to 63). For the last two circumferential pressure distributions around the trailing edge of the wing root hump at x = 149.5 and 156.5 inches, the suction peak is no longer present. There are signs of possible post-stall vortical flows along the upper water line for the four circumferential fuselage stations around the trailing edge of the wing root hump (132.5 inches $\leq x \leq$ 156.5 inches).

Nacelle

The C_p distributions on the nacelle for the AFC-on and AFC-off cases at 5 angles of attack are shown in Figs. 64 to 70.

The streamwise pressure distributions covering both the interior and exterior of the nacelle for the 12, 3, 9, and 6 o'clock positions (facing downstream) are shown in Figs. 64 to 67, respectively. At the 12 o'clock position, the AFC-off case produced the highest suction pressures at $\alpha = 17.1°$, whereas for the AFC-on case at this same angle of attack, the pressure distributions indicate flow separation around the nacelle leading edge, as shown by the flattened C_p curve (Fig. 64). This is attributed to an AFC-induced increase in flow circulation (and lift), which also reduces the stall angle by up to 3° (Fig. 20). Note that there were no transition dots installed on the nacelle leading edge, which means a laminar separation bubble could occur there at high angles of attack. The internal nacelle pressure distributions produced only a slight increase in positive pressure for the AFC-on case and there was only a marginal increase in positive pressures as the angle of attack increased.

The streamwise pressure distributions at the 3 and 9 o'clock positions are somewhat similar in shape, but the pressure levels differ (Figs. 65 and 66, respectively). The latter has more than double the suction peak as the former, indicating possible localized spanwise flows in the outboard direction. The AFC-on case only produced a marginal increase in suction pressure at the 9 o'clock position but made no significant difference at the 3 o'clock position. At the 6 o'clock position, the nacelle interior behaved as the suction surface and the external side acted as the pressure surface (Fig. 67). The difference in pressure distributions between the AFC-on and AFC-off cases are marginal. Compared to the 12 o'clock position, the maximum suction pressures were reduced by a factor of nearly 5 for the 9 and 6 o'clock positions, whereas the maximum suction pressures was reduced by a factor of 12 for the 3 o'clock position.

Exterior circumferential pressure distributions covering 180° of the nacelle upper surface (between 3 and 9 o'clock) at $x \approx 99.8$ inches are shown in Fig. 68. The AFC-induced suction pressure increase can be seen for most angles of attack between $22.5° \leq \theta \leq 180°$. The maximum suction pressure increase occurred between $67.5° \leq \theta \leq 157.5°$ at $\alpha = 17.1°$ (Fig. 68)

Interior circumferential pressure distributions covering 360° of the inner nacelle surface at $x \approx 106.6$ inches are shown in Fig. 69. The internal circumferential pressures are positive and sinusoidal with the lowest pressures occurring at $\theta = 270°$ (or at the 6 o'clock position). The AFC-on case has slightly higher pressures than the AFC-off case at most angles of attack over the entire range of θ. The pressure difference is largest at the lowest angle of attack (i.e., $\Delta C_p \approx 0.03$ at $\alpha = 4.7°$).

Pressure distributions on the nacelle pylon at $x = 109.2$ inches are shown in Fig. 70. The AFC-on case shows significantly more suction pressure for the 3 spanwise taps on the pylon. The nacelle with chine produced higher suction pressure than the case without chine for $\alpha \geq 13°$ (not shown).

Effect of wall correction on parameters affecting C_p values

For completeness, the effect of wall correction on parameters affecting the C_p values is illustrated here. Figure 71 shows the variations of $\Delta\alpha_{wc}$ and $\Delta q_{\infty,\mathrm{wc}}$ as a function of uncorrected α due to the application of TWICS wall correction for the AFC-on and AFC-off cases (Runs 109 and 117, respectively).

Figure 71(a) shows that $\Delta\alpha_{wc}$ increased by approximately 0.46° to 1.15° for the AFC-on case, $\Delta\alpha_{wc}$ for the AFC-off case increased by approximately 0.11° to 0.95°. The shape of the two $\Delta\alpha_{wc}$ versus α curves resemble that of the lift curves observed for Runs 109 and 117, and the two curves represent the upper and lower boundaries of the variation in $\Delta\alpha_{wc}$ for all AFC configurations tested.

Figure 71(b) shows that $\Delta q_{\infty,\mathrm{wc}}$ increased by ~0.5 psf up to $\alpha \approx 12°$ for both cases, where $\Delta q_{\infty,\mathrm{wc}}$ values increase more steeply thereafter to ~0.9 psf at $\alpha \approx 18.5°$. Since q_∞ is in the denominator of the C_p equation, the relatively small increase in q_∞ for the wall-correction case led to a slight decrease in the pressure magnitude (i.e., $|\Delta C_p| < 0.15$) compared to the case without the wall correction.

D. Unsteady Pressure Data

Similar to the static pressures presented in the previous subsection, the AFC-off case (Run 74) and the best HELP actuation (Run 103; HELP-10C^ configuration with NPR = 2.5) were chosen for further comparison of spectral density from the unsteady pressure measurements, as shown in Figs. 72 to 83. Again, the data are presented at the two angles of attack of $\alpha = 8.9°$ and 17.1° for the two CRM-SHL-AFC cases. The autospectral density of fluctuating pressure (G_{pp}) has been normalized by the uncorrected tunnel dynamic pressure (q_∞) and the resulting unit is per Hz.

The sampling frequency of the unsteady pressure data was 50 kHz to satisfy the Nyquist sampling criterion. The low-pass and high-pass filter settings were 20 kHz and 0.25 Hz, respectively. The usable bandwidth for these measurements was on the order of 20 kHz. The noise floor was significantly smaller than the signal obtained during wind-on tunnel operation [41]. The often-present broad peak just shy of 20 kHz was due to the addition by the manufacturer of inline amplifiers in the cables downstream of the transducers and should be disregarded. Because the cable lengths were long, the addition of inline amplifiers was needed to reduce noise levels that was required by the aeroacoustic measurements [38].

The $G_{pp}/q_{\infty,u}^2$ comparisons are shown for the sensors on the simple-hinged flaps, pylon, and wingtip in the following subsections. For clarity, an image identifying the locations of the unsteady pressure sensors accompanies each figure.

Simple-Hinged Flaps

The autospectral density results from 12 unsteady pressure sensors (Ch0 to Ch11) on the simple-hinged flaps are shown in Figs. 72 to 77. Generally speaking, the high-speed jets from the HELP actuators and the corresponding significant acceleration of flow over the flap shoulder resulted in a significant increase in the spectral density levels (i.e., energy associated with the turbulent pressure field) for the AFC-on cases. However, the increase of spectral density in the higher frequency range (greater than ~1 kHz) is significantly reduced for all the trailing-edge sensors (i.e., odd number channels).

Channels 0, 2, 4, 8, and 10 sensors are located immediately downstream of AFC Cartridges 1, 3, 4, 8, and 10, respectively; whereas the Channel 6 sensor is located next to a small unactuated gap between Cartridges 5 and 6 (see Fig. 12(a)). Consequently, Figs. 72(a), 73(a), and 74(a) indicate a spectral peak at around 1100 Hz for Channels 0, 2, and 4 on the inboard flap, which is in agreement with the measured oscillating frequency of ~1100 Hz for the Row 1 sweeping jets on the HELP actuators at NPR = 2.5 from benchtop measurements (Fig. 7). Because of the slightly smaller actuator cartridges and nozzles for the outboard flap, Figs. 76(a), and 78(a) indicate a spectral peak at around 1800 Hz for Channels 8 and 10 on the outboard flap, which is also in agreement with the benchtop measurements. The additional spectral peaks observed at higher frequencies could represent higher harmonics (i.e., 2nd, 3rd, and 4th harmonics) of that fundamental frequency.

The broad, low-frequency peak between approximately 50–200 Hz commonly observed in Channels 5 to 11 could be attributed to either an interaction between the oscillating AFC wake and the (probably) separated flow between cartridges or to the 3D flow separation on the outboard flap for the AFC-off case. Evidence of the AFC-induced 3D flow on the simple-hinged flap can also be seen in the spanwise C_p distribution in Figs. 53 and 54, as well as in the published flow-visualization results [27] and CFD simulations [29,30].

For the eight sensors located farther away from the wing root (Channels 4 to 11), the spectral density remains relatively invariant for either the AFC-on case or the AFC-off case at the two angles of attack examined (Figs. 74 to 77). Perhaps due to the increased attached flow and/or lesser interaction of the separated flow with the wing/fuselage juncture vortex at higher angles of attack, the four sensors near the wing root indicate a significant reduction of the spectral density across the frequency range for the AFC-on case at $\alpha = 17.1°$ compared to $\alpha = 8.9°$ (Figs. 72 and 73).

Pylon

The autospectral density results from 6 unsteady pressure sensors on the pylon are shown in Figs. 78 to 80. The transducer channels are Channels 18 to 24. Note that Channel 22 was bad, and its results are not being presented. Generally speaking, the pylon spectral density levels are higher for the AFC-on case compared to the AFC-off case, and they are also higher at higher angles of attack.

Sensors for Channels 18, 19, and 20 are located relatively close together on the inboard side of the pylon. The spectral density features for these 3 channels are somewhat similar, as shown in Figs. 78(a), 78(b), and 79(a). The various “humps” in the curves are likely influenced by the vortical structures emanating from nacelle/pylon and the side edge of the inboard slat, such as the inboard slat vortex, inboard cutout vortex, and nacelle/pylon vortex identified by Koklu et al. [26].

The sensor for Channel 21 is located near the 12 o'clock position of the pylon about halfway between the inboard and the outboard side of the pylon. Perhaps because the sensor is located almost underneath the slatless WUSS and close to the vicinity of its attachment line, Fig. 79(b) shows there are less variations in the spectral density levels with and without the activation of AFC at the two angles of attack compared to other sensor locations on the pylon. The AFC-on case at $\alpha = 8.9°$ produced the lowest level of spectral density (Fig. 79(b)).

Sensors for Channels 23 and 24 are located relatively close together on the outboard side of the pylon. The spectral density features for these 2 channels are somewhat similar, as shown in Figs. 80(a) and 80(b). Except for a "hump" around 100 Hz for the AFC-on case at $\alpha = 17.1°$, the spectral curves do not have multiple humps as observed on the inboard side for Channel 18 to 20, which means that there could be less influence of vortical flows on the outboard side of the pylon.

The vortical flows around the pylon are 3D and complicated [26]. However, their exact nature and influence are somewhat unclear without more detailed flowfield measurements.

Wingtip

The autospectral density results from 5 unsteady pressure sensors on the wingtip are shown in Figs. 81 to 83. The transducer channels are Channels 25 to 30. Note that Channel 29 was bad, and its results are not being presented.

Figure 81(a) shows the results of Channel 25, which is the most inboard sensor location around the forward part of the wingtip. The figure shows higher spectral density levels for the AFC-on case compared to the AFC-off case, as well as higher levels at higher angle of attack ($\alpha = 17.1°$). Sensors for Channels 26 and 27 are located slightly outboard of Channel 25 (and closer to the wingtip), with Channel 27 located just upstream and slightly outboard of Channel 26. Spectral density results shown in Figs. 81(b) and 82(a) are somewhat similar for these two channels, where the AFC-off case at $\alpha = 8.9°$ produced the highest spectral level for $f < 1$Kz, which was not observed for Channel 25 (Fig. 81(a)).

Channel 28 is located nearer to the wingtip trailing edge. At this location, Fig. 82(b) shows that the AFC-on and AFC-off cases at $\alpha = 8.9°$ have the higher spectral density levels, which is opposite to the observation made from sensors elsewhere.

Channel 30 is located on the lower surface of the wingtip leading edge, in the vicinity of the wingtip flow attachment line. At this location, Fig. 83 shows that there is a broad-band hump around 1 kHz for all cases. The AFC-on case at $\alpha = 8.9°$ has the highest spectral density level, whereas the AFC-on case at $\alpha = 17.1°$ has the lowest level. This is perhaps caused by the attachment line being moved further downstream (and away from the sensor) due to the AFC.

Conclusions

A 10%-scale CRM-SHL-AFC configuration was successfully tested at the NASA LaRC 14x22. The CRM-SHL-AFC has a set of 30º inboard and outboard slats, an engine nacelle/pylon, and a pair of 50° inboard and 55° outboard simple-hinged flaps. Three new types of AFC approaches were examined: Double-Row Sweeping Jets (DRSWJ), Alternating Pulsed Jets (APJ), and High Efficiency Low Power (HELP) actuators. Some key findings from this wind tunnel investigation are as follows:

1) The AFC-induced ΔC_L enhancement was maintained for the entire lift curve for most flow control configurations examined (HELP-Fig. 20, DRSWJ-Fig. 27, APJ-Fig. 29).
2) Activating the Row 1 sweeping jets, even with a relatively small amount of mass flow, is essential to maintain the lift increment for the entire angle of attack range (Fig. 17).
3) Adding VGs just upstream of the Row 1 sweeping jets did not enhance the lift increment nor could the Row 1 sweeping jets performance be replicated by the VGs (Fig. 18). Adding VGs on the slatless WUSS produced no noticeable effects (Fig. 30).
4) More pneumatic power is required to achieve the lift performance goal near maximum lift than at lower angles of attack (Figs. 38 and 39). One reason for this is the steeper slope of the (target) lift curve for the reference CRM-HL that possesses Fowler flaps.
5) Although several HELP actuation configurations were able to match the lift achieved by the reference CRM-HL at lower angles of attack, only the full-coverage configuration with a constant spanwise NPR of ~2.5 was able to achieve the lift goal of $C_L = 2.45$ for the maximum lift condition ($\alpha \sim 17°$) (Fig. 33).

6) Comparing the actuators tested, based on the power coefficient (C_π), the HELP actuators are most efficient for $C_\pi \geq 0.08$ and $\Delta C_L \geq 0.25$, both for $\alpha = 8.9°$ and 17.1°, whereas the DRSWJ actuators are slightly more efficient for $C_\pi < 0.08$ and $\Delta C_L < 0.25$ near the maximum lift ($\alpha = 17.1°$) (Figs. 38 and 39).
7) With the HELP actuators, mass flow rates greater than ~0.91 lbm/s and NPR values greater than ~1.8 (corresponding to $C_\pi = 0.18$, $C_Q = 0.0027$, and $C_\mu = 0.025$) are needed to achieve the lift enhancement goal at $\alpha = 8.9°$, whereas mass flow rates greater than ~1.23 lbm/s and NPR values greater than ~2.3 (corresponding to $C_\pi = 0.3$, $C_Q = 0.0036$, and $C_\mu = 0.037$) are needed to achieve the lift enhancement goal at $\alpha = 17.1°$ (Figs. 34, 32, 35 and 33).
8) AFC on the flap shoulder increased the suction pressures (and flow circulation) globally, in both the streamwise and the spanwise directions, and thereby enhanced the lift over the entire wing (Figs. 40–54).
9) AFC also produced a certain amount of suction pressure increment on the fuselage and nacelle, which contribute to the total increase in lift observed (Figs. 55–70).
10) The nacelle leading edge at the 12 o'clock position produced the highest suction pressures of all of the measured nacelle pressures; however, flow separation was observed there for the best AFC configuration at $\alpha = 17.1°$, compared to the AFC-off case where the flow remained attached at $\alpha = 17.1°$ (Fig. 64).
11) Unsteady pressure measurements confirm the sweeping jet frequencies from Row 1 of the HELP actuators and identify regions of possible vortical flows and flow separation (Figs. 72–80).

The successful development and testing of the CRM-SHL-AFC configuration has proven the efficacy of applying active flow control on a high-lift system. In addition, an "open" geometry high-lift model with integrated modular AFC is available for future R&D efforts.

References

[1] Greenblatt, D. and Wygnanski, I. J., "The Control of Flow Separation by Periodic Excitation," *Progress in Aerospace Sciences*, Volume 36, Issue 7, 2000, pp. 487–545. doi: 10.1016/S0376-0421(00)00008-7

[2] Cattafesta III, L. N. and Sheplak, M., "Actuators for Active Flow Control," *Annual Review of Fluid Mechanics*, Vol. 43, Issue 1, August 2010, pp. 247–272. doi:10.1146/annurev-fluid-122109-160634

[3] McLean, J. D., Crouch, J. D., Stoner, R. C., Sakurai, S., Seidel, G. E., Feifel, W. M., and Rush, H. M., "Study of the Application of Separation Control by Unsteady Excitation to Civil Transport Aircraft," NASA/CR 1999–209338, 1999.
https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19990061938.pdf

[4] Hartwich, P. M., Camacho, P. P., El-Gohary, K., Gonzales. A. B., Lawson, E. L., and Shmilovich, A., "System-Level Trade Studies for Transonic Transports with Active Flow Control (AFC) Enhanced High-Lift Systems," *55th AIAA Aerospace Sciences Meeting*, AIAA Paper 2017-0321, 2017. doi: 10.2514/6.2017-0321

[5] Shmilovich, A., Yadlin, Y., Dickey, E. D., Hartwich, P.M., and Khodadoust, A., "Development of an Active Flow Control Technique for an Airplane High-Lift Configuration," *55th AIAA Aerospace Sciences Meeting*, AIAA Paper 2017-0322, 2017. doi: 10.2514/6.2017-0322

[6] Loftin, L. K., "Quest for Performance – The Evolution of Modern Aircraft," NASA SP-468, 1985. https://www.hq.nasa.gov/pao/History/SP-468/ch10-5.htm

[7] Lin, J. C., Melton, L. P., Viken, S. A., Andino, M. Y., Koklu, M., Hannon, J. A., and Vatsa, V. N., "High Lift Common Research Model for Wind Tunnel Testing: An Active Flow Control Perspective," *55th AIAA Aerospace Sciences Meeting*, AIAA Paper 2017-0319, 2017. doi: 10.2514/6.2017-0319

[8] Jones, G. S., Milholen, W. E., II, Chan, D. T., Melton, L. P., Goodliff, S. L., and Cagle, C. M., "A Sweeping Jet Application on a High Reynolds Number Semispan Supercritical Wing Configuration," *35th AIAA Applied Aerodynamics Conference*, AIAA Paper 2017-3044, 2017. doi: 10.2514/6.2017-3044

[9] Milholen, W. E., II, Jones, G. S., Chan, D. T., Goodliff, S. L., Anders, S. G., Melton, L. P., Carter, M. B., Allan, B. G., and Capone, F. J., "Enhancements to the FAST-MAC Circulation Control Model and Recent High-Reynolds Number Testing in the National Transonic Facility," *31st AIAA Applied Aerodynamics Conference*, AIAA Paper 2013-2794, 2013. doi: 10.2514/6.2013-2794

[10] Gregory, J. W. and Tomac, M. N., "A Review of Fluidic Oscillator Development and Application for Control," *43rd Fluid Dynamics Conference*, AIAA Paper 2013–2474, 2013. doi: 10.2514/6.2013-2474

[11] Seele, R., Tewes, P., Woszidlo, R., McVeigh, M.A., Lucas, N. J., and Wygnanski, I. J., "Discrete Sweeping Jets as Tools for Improving the Performance of the V-22", *Journal of Aircraft*, Vol. 46, No. 6, pp. 2098–2106, Dec. 2009. doi: 10.2514/1.43663

[12] Seele, R., Graff, E., Lin, J., and Wygnanski, I., "Performance Enhancement of a Vertical Tail Model with Sweeping Jet Actuators," *51st AIAA Aerospace Sciences Meeting*, AIAA Paper 2013-0411, 2013. doi: 10.2514/6.2013-411

[13] Seifert, A., "Evaluation Criteria and Performance Comparison of Actuators for Bluff-Body Flow Control," *32nd AIAA Applied Aerodynamics Conference,* AIAA Paper 2014-2400, 2014. doi: 10.2514/6.2014-2400

[14] Koklu, M., "The Effects of Sweeping Jet Actuator Parameters on Flow Separation Control," *45th AIAA Fluid Dynamics Conference*, AIAA Paper 2015-2485, 2015. doi: 10.2514/6.2015-2485

[15] Melton, L. P., Koklu, M., Andino, M., and Lin, J. C., "Active Flow Control via Discrete Sweeping and Steady Jets on a Simple-Hinged Flap," *AIAA Journal*, Vol. 56, No. 8, August 2018, pp. 2961–2973. doi: 10.2514/1.J056841

[16] Melton, L. P., Koklu, M., Andino, M., and Lin, J. C., "Sweeping Jet Optimization Studies," *8th AIAA Flow Control Conference*, AIAA Paper 2016-4233, 2016. doi: 10.2514/6.2016-4233

[17] Ghee, T. A., Raghu, S., and Morgan, A. N., "Sweeping Jet Active Flow Control on a Representative High Performance Military Wing," *2018 AIAA Aerospace Sciences Meeting*, AIAA Paper 2018-1800, 2018. doi: 10.2514/6.2018-1800

[18] Woszidlo, R., Ostermann, F., Schmidt, H.J., "Fundamental Properties of Fluidic Oscillators for Flow Control Applications", *AIAA Journal*, Vol. 57, No. 3, January 2019, pp. 978–992. doi: 10.2514/1.J056775

[19] Andino, M. Y., Lin, J. C., Seele, R., Graff, E. C., Gharib, M., Whalen, E. A., and Wygnanski, I. J., "Active Flow Control on Vertical Tail Models," *AIAA Journal*, Vol. 57, No. 8, August 2019, pp. 3322–3338. doi: 10.2514/1.J057876

[20] Lin, J. C., Whalen, E. A., Andino, M. Y., Graff, E. C., Lacy, D. S., Washburn, A. E., Gharib, M., and Wygnanski, I. J., "Full-Scale Testing of Active Flow Control Applied to a Vertical Tail," *Journal of Aircraft*, Vol. 56, No. 4, July 2019, pp. 1376–1386. doi: 10.2514/1.C034907

[21] Whalen, E. A., Shmilovich, A., Spoor, M., Tran, J., Vijgen, P., Lin, J. C., and Andino, M., "Flight Test of an Active Flow Control Enhanced Vertical Tail," *AIAA Journal*, Vol. 56, No. 9, August 2018, pp. 3393–3398. doi: 10.2514/1.J056959

[22] Lacy, D. S. and Sclafani, A. J., "Development of the High Lift Common Research Model (HL-CRM): A Representative High Lift Configuration for Transonic Transports," *54th AIAA Aerospace Sciences Meeting*, AIAA Paper 2016-0308, 2016. doi: 10.2514/6.2016-0308

[23] Lin, J. C., Melton, L. P., Hannon, J. A., Andino, M. Y., Koklu, M., Paschal, K. B., and Vatsa, V. N., "Wind Tunnel Testing of Active Flow Control on the High Lift Common Research Model," *AIAA AVIATION 2019 Forum*, AIAA Paper 2019-3723, 2019. doi: 10.2514/6.2019-3723

[24] Melton, L. P., Lin, J. C., Hannon, J. A., Andino, M. Y., Koklu, M., and Paschal, K. B., "Sweeping Jet Flow Control on the Simplified High-Lift Version of the Common Research Model," *AIAA AVIATION 2019 Forum*, AIAA Paper 2019-3726, 2019. doi: 10.2514/6.2019-3726

[25] Koklu, M., Lin, J. C., Hannon, J. A., Melton, L. P., Andino, M. Y., Paschal, K. B., and Vatsa, V. N., "Surface Flow Visualization of the High-Lift Common Research Model," *AIAA AVIATION 2019 Forum*, AIAA Paper 2019-3727, 2019. doi: 10.2514/6.2019-3727

[26] Koklu, M., Lin, J. C., Hannon, J. A., Melton, L. P., Andino, M. Y., Paschal, K. B., and Vatsa, V. N., "Mitigation of Nacelle/Pylon Wake on the High-Lift Common Research Model Using a Nacelle Chine," *AIAA SciTech 2020*, AIAA Paper 2020-0786, 2020. doi: 10.2514/6.2020-0786

[27] Lin, J. C., Melton, L. P., Hannon, J. A., Andino, M. Y., Koklu, M., Paschal, K. B., and Vatsa, V. N., "Wind Tunnel Testing of High Efficiency Low Power (HELP) Actuation for Active Flow Control," *AIAA SciTech 2020 Forum*, AIAA Paper 2020-0783, 2020. doi: 10.2514/6.2020-0783

[28] Lin, J. C., Melton, L. P., Hannon, J. A., Andino, M. Y., Koklu, M., Paschal, K. B., and Vatsa, V. N., "Testing of High-Lift Common Research Model with Integrated Active Flow Control," *Journal of Aircraft*, Vol. 57, No. 6, November 2020, pp. 1121–1133. doi: 10.2514/1.C035906

[29] Vatsa, V. N., Duda, B., Lin, J. C., Melton, L. P., Lockard, D. P., O'Connell, M., and Hannon, J. A., "Comparative Study of Active Flow Control Strategies for Lift Enhancement of a Simplified High-Lift Configuration," *AIAA AVIATION 2019 Forum*, AIAA Paper 2019-3724, 2019. doi: 10.2514/6.2019-3724

[30] Vatsa, V. N., Lin, J. C., Melton, L. P., Lockard, D. P., and Ferris, R., "CFD and Experimental Data Comparisons for Conventional and AFC-Enabled CRM High-Lift Configurations," *AIAA AVIATION 2020 Forum*, AIAA Paper 2020-2939, 2020. doi: 10.2514/6.2020-2939

[31] Ulbrich, N., "The Real-Time Wall Interference Correction System of the NASA Ames 12-Foot Pressure Wind Tunnel," NASA/CR – 1998-208537, July 1998.

[32] Ulbrich, N. and Boone, A. R., "Real-Time Wall Interference Correction System of the 12-Foot Pressure Wind Tunnel," *36th AIAA Aerospace Sciences Meeting*, AIAA Paper 98-0707, 1998. doi: 10.2514/6.1998-707

[33] Iyer, V., Kuhl, D. D., and Walker, E. L., "Improvements to Wall Corrections at the NASA Langley 14X22-Foot Subsonic Tunnel," *21st AIAA Applied Aerodynamics Conference*, AIAA Paper 2003-3950, 2003. doi: 10.2514/6.2003-3950

[34] Gentry, G. L., Quinto, F. P., Gatlin, G. M., Applin, Z. T. "The Langley 14- by 22-Foot Subsonic Tunnel: Description, Flow Characteristics, and Guide for Users," NASA-TP-3008, September 1990. https://ntrs.nasa.gov/search.jsp?R=19900018333

[35] Hannon, J. A., Washburn, A. W., Jenkins, L. N., and Watson, R. D., "Trapezoidal Wing Experimental Repeatability and Velocity Profiles in the 14- by 22-Foot Subsonic Tunnel," *50th AIAA Aerospace Sciences Meeting*, AIAA Paper 2012-0706, 2012. doi: 10.2514/6.2012-0706

[36] Neuhart, D. H. and McGinley, C. B., "Free-Stream Turbulence Intensity in the Langley 14- by 22-Foot Subsonic Tunnel," NASA TP 213247, August 2004. https://ntrs.nasa.gov/citations/20040120956

[37] Van Dam, C. P., "The Aerodynamic Design of Multi-Element High-Lift Systems for Transport Airplanes," *Progress in Aerospace Sciences*, Vol. 38, 2002, pp. 101–144. doi: 10.1016/S0376-0421(02)00002-7

[38] Lockard, D. P., O'Connell, M. D., Vatsa, V. N., and Choudhari, M. M., "Assessment of Aeroacoustic Simulations of the High-Lift Common Research Model," *25th AIAA/CEAS Aeroacoustics*

Conference, AIAA Paper 2019-2460, 2019. doi: 10.2514/6.2019-2460

[39] Gatlin, G. M. and McGhee, R. J., "Experimental Investigation of Semispan Model Testing Techniques," *Journal of Aircraft*, Vol. 34, No. 4, July-August 1997, pp. 500–505. doi: 10.2514/2.2219

[40] Koklu, M., "A Numerical and Experimental Investigation of Flow Separation Control over a Wall-Mounted Hump Model," *2018 AIAA Aerospace Sciences Meeting*, AIAA Paper 2018-1280, 2018. doi: 10.2514/6.2018-1280

[41] Paschal, K. B., Kegerise, M. A., Neuhart, D. H., Koklu, M., and Lin, J. C., "Unsteady Pressure Measurements on a Simplified High-Lift Configuration of the Common Research Model using Active Flow Control," *2021 AIAA SciTech Forum* (virtual event), AIAA Paper 2021-1647, 2021. doi: 10.2514/6.2021-1647

Table 1. AFC configuration designation.

Configuration Designation	Run number	Descriptions
AFC-off	45*, 46*, 47*, 52, 54, 66†, 74, 90†, 93†, 96†, 117, 134, 147, 153††, 171†, 172	No activation of AFC cartridges
AFC-off-R1VGs	85	No activation of AFC cartridges; with 79 VGs located just upstream of Row 1 actuators
AFC-off-NWVGs	152	No activation of AFC cartridges; with 6 VGs located downstream of nacelle on slatless WUSS
HELP-4C	61, 62	Activation of 4 HELP AFC cartridges (C1-C4)
HELP-6C	63, 64	Activation of 6 HELP AFC cartridges (C1-C6 or C1-C4 plus C7-C8)
HELP-8C	57, 59, 60, 67†, 68†, 69†, 73	Activation of 8 HELP AFC cartridges (C1-C8)
HELP-10C	71, 72, 75, 91†, 92†, 94†, 95†, 97†, 98	Activation of all 10 HELP AFC cartridges
HELP-10C-R1ENS	80, 81	Activation of all 10 HELP AFC cartridges; Row 1 even nozzles sealed
HELP-10C-R1ENS-ST	82	Activation of all 10 HELP AFC cartridges; Row 1 even nozzles sealed; spanwise NPR tailoring
HELP-10C-R1S	77, 78,	Activation of all 10 HELP AFC cartridges; Row 1 nozzles sealed
HELP-10C-R1S+R1VGs	86, 87, 88	Activation of all 10 HELP AFC cartridges; Row 1 nozzles sealed with 79 VGs located just upstream of Row 1 actuators
HELP-10C-R1VGs	89	Activation of all 10 HELP AFC cartridges; with 79 VGs located just upstream of Row 1 actuators
HELP-8C^	111, 113	Activation of 8 HELP AFC cartridges (C1-C8)
HELP-8C-ST^	114	Activation of all 8 HELP AFC cartridges (C1-C8); spanwise NPR tailoring
HELP-10C^	101, 102, 103, 104, 106, 107, 108, 109**, 110,	Activation of all 10 HELP AFC cartridges
HELP-10C-ST^	115, 116	Activation of all 10 HELP AFC cartridges; spanwise NPR tailoring
DRSWJ-10C^	139, 140, 141. 142, 143, 145, 146, 168†, 169†, 170†	Activation of all 10 DRSWJ AFC cartridges
DRSWJ-10C-ENS^	129, 130, 131	Activation of all 10 DRSWJ AFC cartridges; all even nozzles sealed on both AFC rows
DRSWJ-10C-R2S^	135, 136+137, 138	Activation of all 10 DRSWJ AFC cartridges; Row 2 sweeping jet nozzles sealed
DRSWJ-10C-R2S+R1ENS^	127, 128	Activation of all 10 DRSWJ AFC cartridges; Row 2 sweeping jets sealed and Row 1 even nozzles sealed
APJ-10C^	159, 163, 164, 165	Activation of all 10 APJ AFC cartridges

* Preliminary checkout runs, several open test section wall windows, model surface not fully prepped for testing (i.e., missing filler, missing tape)

† Lower Mach number runs ($M_\infty < 0.2$)

†† Tufts located downstream of slatless WUSS on model

^ Measured with a higher flow rate (thermal mass) flowmeter (i.e., for run numbers greater than 100).

** Best AFC case

Table 2. Test Summary of HELP Actuators (Runs 45 to 117).

Run No.	M_∞	Re_{MAC} (10^6)	AFC Configuration Designation	NPR (avg)	$\dot{m}$ (lbm/s)	With TWICS		Without TWICS		Comments
						Fig. No.	Table No.	Fig. No.	Table No.	
45	0.2	3.27	AFC-off	1	0	13	B1	D1	C1	Increasing alpha, checkout run
46	0.2	3.27	AFC-off	1	0	13	B2	D1	C2	Decreasing alpha, checkout run
47	0.2	3.27	AFC-off	1	0	13	B3	D1	C3	Floor BLRS on, checkout run
52§	0.2	3.27	AFC-off	1	0	14	B4	D2	C4	AFC off, actuators covered
54	0.2	3.27	AFC-off	1	0	14,15,16	B5	D2,D3,D4	C5	Repeat of AFC-off run
57	0.2	3.27	HELP-8C	1.55	0.62	16	B6	D4	C6	
59	0.2	3.27	HELP-8C	1.95	0.79	16	B7	D4	C7	
60	0.2	3.27	HELP-8C	1.25	0.44	16	B8	D4	C8	
61	0.2	3.27	HELP-4C	2.23	0.47	15	B9	D3	C9	NPR=2.25 for C1-C2, NPR=2.1 for C3-C4
62	0.2	3.27	HELP-4C	1.56	0.32	15	B10	D3	C10	
63	0.2	3.27	HELP-6C	2.02	0.63	15	B11	D3	C11	Activation of C1-C6
64	0.2	3.06	HELP-6C	2.00	0.62	15	B12	D3	C12	Activation of C1-C4 and C7-C8
66	0.15	2.35	AFC-off	1	0	23	B13	D11	C13	Lower Mach number run
67	0.15	2.35	HELP-8C	1.89	0.78	23	B14	D11	C14	Lower Mach number run
68	0.15	2.35	HELP-8C	1.49	0.60	23	B15	D11	C15	Lower Mach number run
69	0.15	2.35	HELP-8C	1.74	0.70	23	B16	D11	C16	Lower Mach number run, NPR=2 for C1-C4, NPR=1.5 for C5-C8
71	0.2	3.27	HELP-10C	1.51	0.75	18,19	B17	D6, D7	C17	New C10 installed
72	0.2	3.27	HELP-10C	1.68	0.79	19	B18	D7	C18	NPR=2 for C1-C4, NPR=1.3 for C5-C10
73	0.2	3.27	HELP-8C (ST)	1.99	0.79	16	B19	D4	C19	NPR=2.3 for C1-C2, NPR=2.2 for C3-C4, NPR=1.95 for C5-C6, NPR=1.5 for C7-C8
74§§	0.2	3.27	AFC-off	1	0	14,17, 18,19	B20	D2, D5, D6, D7	C20	Repeat of AFC-off run
75	0.2	3.27	HELP-10C	1.27	0.57	19	B21	D7	C21	
77	0.2	3.27	HELP-10C-R1S	1.26	0.44	17	B22	D5	C22	All Row 1 SWJ sealed
78	0.2	3.27	HELP-10C-R1S	1.49	0.58	17	B23	D5	C23	All Row 1 SWJ sealed
80	0.2	3.27	HELP-10C-R1ENS	1.53	0.69	17	B24	D5	C24	All even SWJ on Row 1 sealed
81	0.2	3.27	HELP-10C-R1ENS	1.76	0.80	17	B25	D5	C25	All even SWJ on Row 1 sealed
82	0.2	3.27	HELP-10C-R1ENS-ST	1.84	0.79	17	B26	D5	C26	All even SWJ on Row 1 sealed; NPR=2 for C1-C4, NPR=1.3 for C5-C10

§ Including unsteady pressure data
§§ Unsteady pressure data are used for comparative autospectral density plots: Figure 72 to Figure 83

Table 2. Concluded.

Run No.	M_∞	Re_{MAC} (10^6)	AFC Configuration Designation	NPR (avg)	$\dot{m}$ (lbm/s)	With TWICS		Without TWICS		Comments
							Table No.	Fig. No.	Table No.	
85	0.2	3.27	AFC-off +R1VGs	1	0	18	B27	D6	C27	AFC off, with 79 VGs installed downstream of ME TE
86	0.2	3.27	HELP-10C-R1S+R1VGs	1.29	0.48	18	B28	D6	C28	Row 1 SWJ sealed with 79 VGs installed downstream of ME TE
87	0.2	3.27	HELP-10C-R1S+R1VGs	1.51	0.61	18	B29	D6	C29	Row 1 SWJ sealed with 79 VGs installed downstream of ME TE
88	0.2	3.27	HELP-10C-R1S+R1VGs	1.95	0.80	18	B30	D6	C30	Row 1 SWJ sealed with 79 VGs installed downstream of ME TE
89	0.2	3.27	HELP-10C +R1VGs	1.54	0.79	18	B31	D6	C31	With 79 VGs installed downstream of ME TE
90	0.125	2.04	AFC-off	1	0	24	B32	D12	C32	Lower Mach number run
91	0.125	2.04	HELP-10C	1.12	0.41	24	B33	D12	C33	Lower Mach number run
92	0.125	2.04	HELP-10C	1.48	0.75	24	B34	D12	C34	Lower Mach number run
93	0.15	2.45	AFC-off	1	0	23	B35	D11	C35	Lower Mach number run
94	0.15	2.45	HELP-10C	1.54	0.79	23	B36	D11	C36	Lower Mach number run
95	0.175	2.86	HELP-10C	1.55	0.79	24	B37	D12	C37	Lower Mach number run
96	0.175	2.86	AFC-off	1	0	24	B38	D12	C38	Lower Mach number run
97	0.175	2.86	HELP-10C	1.26	0.58	24	B39	D12	C39	Lower Mach number run
98	0.2	3.27	HELP-10C	1.12	0.42	19	B40	D7	C40	
101	0.2	3.27	HELP-10C^	2.00	1.11	21	B41	D9	C41	New thermal mass flowmeter installed; Include Kulite data
102§	0.2	3.27	HELP-10C^	1.53	0.68	21	B42	D9	C42	
103§§	0.2	3.27	HELP-10C^	2.36	1.32	21	B43	D9	C43	
104§	0.2	3.27	HELP-10C^	1.52	0.69	21	B44	D9	C44	
106	0.2	3.27	HELP-10C^	1.48	0.67	20	B45	D8	C45	
107§	0.2	3.27	HELP-10C^	1.26	0.51	20	B46	D8	C46	
108§	0.2	3.27	HELP-10C^	1.12	0.36	20	B47	D8	C47	
109‡	0.2	3.27	HELP-10C^	2.47	1.37	20,21,22	B48	D8, D9,D10	C48	Most effective AFC case
110	0.2	3.27	HELP-10C^	2.03	1.11	20,21	B49	D8, D9	C49	
111	0.2	3.27	HELP-8C^	2.07	0.92	16	B50	D4	C50	
113	0.2	3.27	HELP-8C^	2.45	1.11	16	B51	D4	C51	
114	0.2	3.27	HELP-8C-ST^	2.34	1.03	22	B52	D10	C52	NPR=2.7 for C1-C2, NPR=2.5 for C3-C4, NPR=2.15 for C5-C6, NPR=1.85 for C7-C8
115	0.2	3.27	HELP-10C-ST^	1.97	1.02	22	B53	D10	C53	NPR=2.5 for C1-C4, NPR=1.4 for C5-C10
116	0.2	3.27	HELP-10C-ST^	2.00	1.05	22	B54	D10	C54	NPR=2.5 for C1-C4, NPR=1.5 for C5-C10
117‡	0.2	3.27	AFC-off	1	0	14,20,21,22	B55	D2, D8, D9, D10	C55	Repeat of AFC-off run

§ Including unsteady pressure data
§§ Unsteady pressure data are used for comparative autospectral density plots: Figs. 72 to 83
‡ Static pressure data are used for comparative C_p plots: Figs. 40 to 71 (with TWICS).

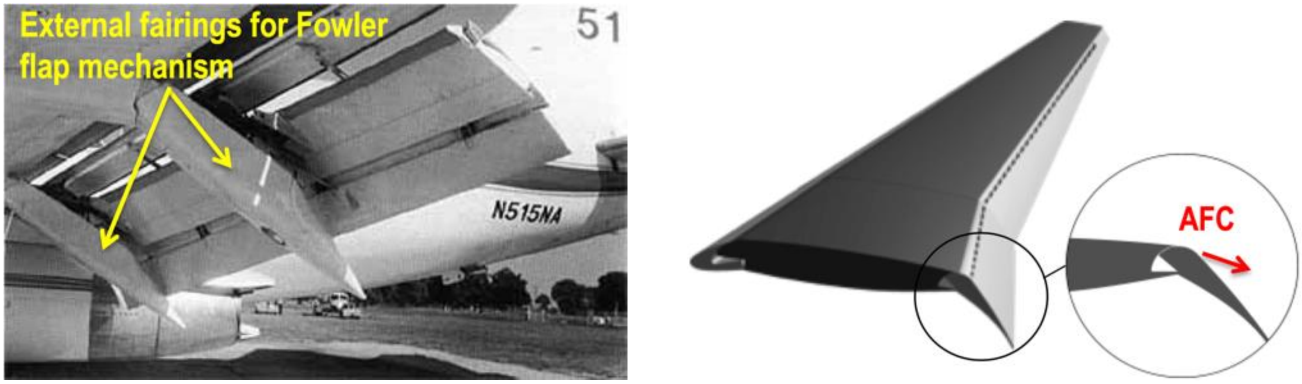
Table 3. Test Summary of DRSWJ Actuators (Runs 127 to 153 and Runs 168 to 172).

Run No.	M_∞	Re_{MAC} (10^6)	AFC Configuration Designation	NPR (avg)	$\dot{m}$ (lbm/s)	With TWICS Fig. No.	With TWICS Table No.	Without TWICS Fig. No.	Without TWICS Table No.	Comments
127	0.2	3.27	DRSWJ-10C-R2S+R1ENS^	1.81	0.09	25	B56	D13	C56	All even SWJ sealed on Row 1, all SWJ sealed on Row 2
128	0.2	3.27	DRSWJ-10C-R2S+R1ENS^	1.55	0.07	25	B57	D13	C57	All even SWJ sealed on Row 1, all SWJ sealed on Row 2
129	0.2	3.27	DRSWJ-10C-ENS^	1.50	0.14	26	B58	D14	C58	All even SWJ sealed on both Row 1 and Row 2
130	0.2	3.27	DRSWJ-10C-ENS^	1.99	0.22	26	B59	D14	C59	All even SWJ sealed on both Row 1 and Row 2
131	0.2	3.27	DRSWJ-10C-ENS^	2.53	0.26	26	B60	D14	C60	All even SWJ sealed on both Row 1 and Row 2
134	0.2	3.27	AFC-off	1	0	14	B61	D2	C61	AFC-off run
135	0.2	3.27	DRSWJ-10C-R2S^	1.26	0.10	25	B62	D13	C62	All SWJ sealed in Row 2
136 +137	0.2	3.27	DRSWJ-10C-R2S^	1.50	0.14	25	B63	D13	C63	All SWJ sealed in Row 2, a merge of Runs 136 & 137
138	0.2	3.27	DRSWJ-10C-R2S^	2.04	0.22	25	B64	D13	C64	All SWJ sealed in Row 2
139	0.2	3.27	DRSWJ-10C^	1.51	0.27	27	B65	D15	C65	
140	0.2	3.27	DRSWJ-10C^	2.00	0.37	27	B66	D15	C66	
141	0.2	3.27	DRSWJ-10C^	2.49	0.48	27	B67	D15	C67	
142§	0.2	3.27	DRSWJ-10C^	1.51	0.28	27	B68	D15	C68	
143	0.2	3.27	DRSWJ-10C^	1.76	0.35	27	B69	D15	C69	
145§	0.2	3.27	DRSWJ-10C^	2.99	0.58	27	B70	D15	C70	
146§	0.2	3.27	DRSWJ-10C^	2.24	0.43	27	B71	D15	C71	
147	0.2	3.27	AFC-off	1	0	14,25,26, 27,29,30	B72	D2,D13,D14, D15,D17, D18	C72	
152	0.2	3.27	AFC-off +SWVGs	1	0	30	B73	D18	C73	VGs on slatless WUSS with tufts downstream
153	0.2	3.27	AFC-off	1	0	30	B74	D18	C74	tufts downstream of slatless WUSS
168	0.15	2.45	DRSWJ-10C^	2.01	0.38	28	B79	D16	C79	Lower Mach number run
169	0.15	2.45	DRSWJ-10C^	1.51	0.28	28	B80	D16	C80	Lower Mach number run
170	0.15	2.45	DRSWJ-10C^	3.01	0.59	28	B81	D16	C81	Lower Mach number run
171	0.15	2.45	AFC-off	1	0	28	B82	D16	C82	Lower Mach number run
172	0.2	3.27	AFC-off	1	0	14	B83	D2	C83	Repeat of AFC-off run

§ Including unsteady pressure data

Table 4. Test Summary of APJ Actuators (Runs 159 to 165).

Run No.	M_∞	Re_{MAC} (10^6)	AFC Configuration Designation	NPR (avg)	$\dot{m}$ (lbm/s)	With TWICS Fig. No.	With TWICS Table No.	Without TWICS Fig. No.	Without TWICS Table No.	Comments
159	0.2	3.27	APJ-10C^	1.52	0.32	29	B75	D17	C75	APJ runs
163	0.2	3.27	APJ-10C^	2.10	0.45	29	B76	D17	C76	
164	0.2	3.27	APJ-10C^	2.48	0.54	29	B77	D17	C77	
165	0.2	3.27	APJ-10C^	2.96	0.65	29	B78	D17	C78	



(a) An example of external fairings for Fowler flap mechanism [Photo: NASA, 6].

(b) Flap high-lift wing with AFC (no external fairings).

Figure 1. Concept of AFC-enabled high-lift system for drag reduction.

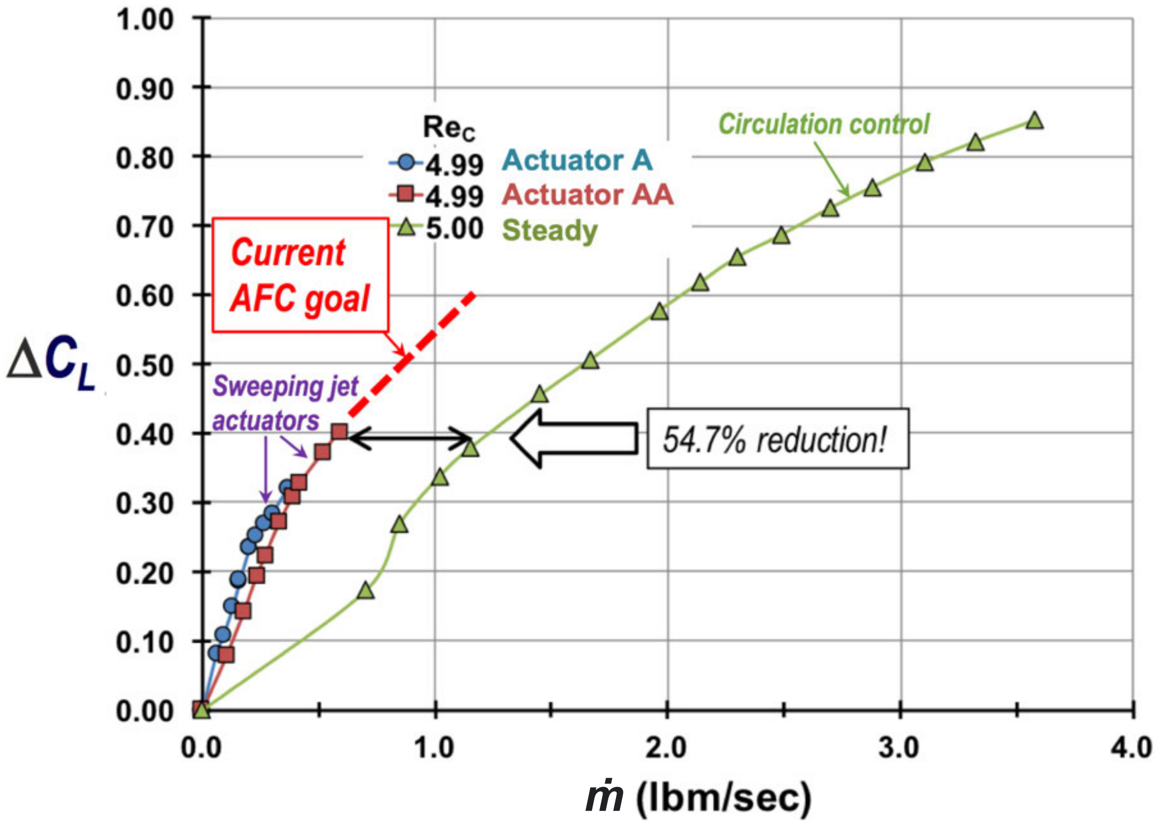


Figure 2. Increase in lift coefficient (ΔC_L) versus the mass flow rate from Fig. 23 of Jones et al. [8] (30° flap deflection, $\alpha = 0°$, and $M_\infty = 0.2$) and the current AFC goal.

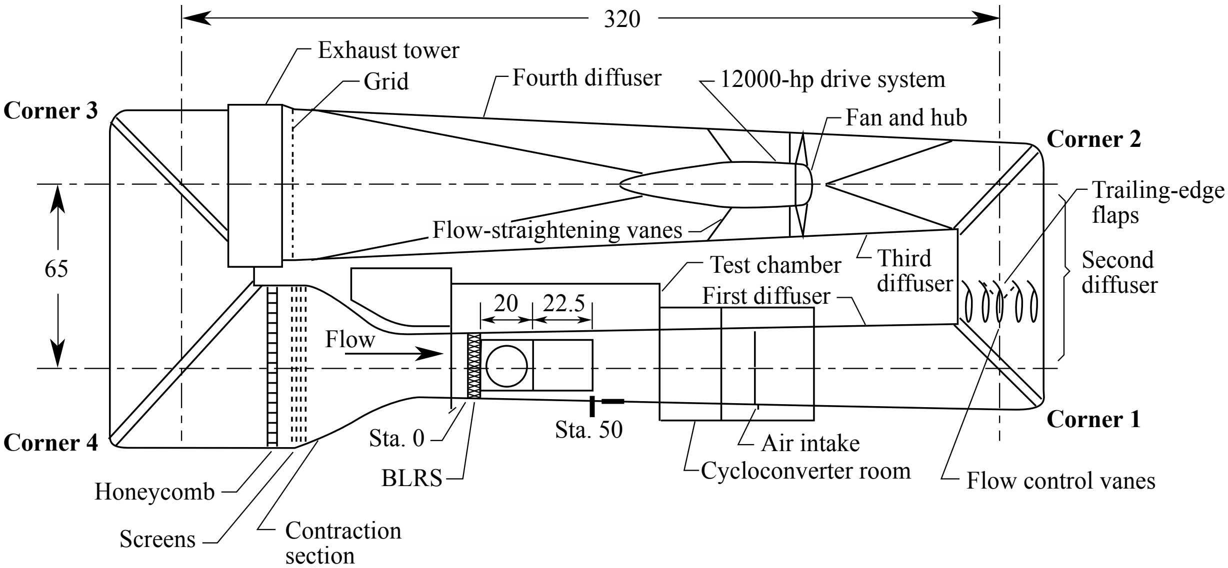


Figure 3. Schematic of the 14x22 tunnel circuit. Dimensions are given in ft.

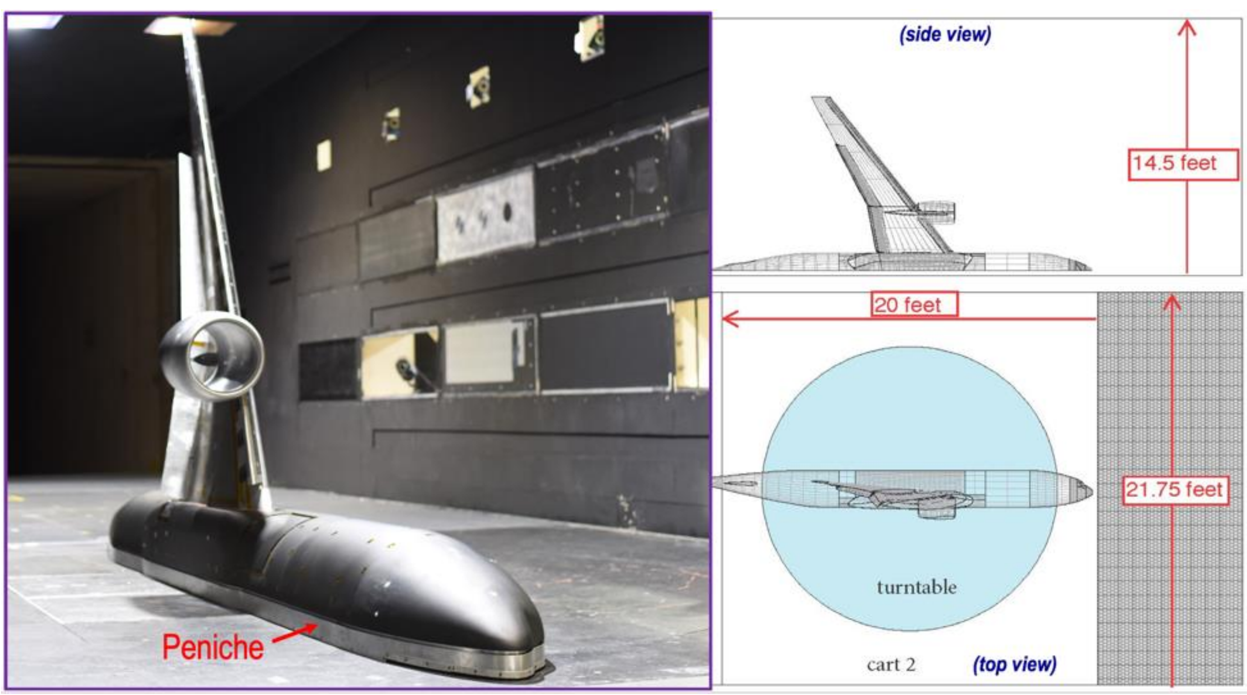


Figure 4. Semispan CRM-SHL-AFC in the 14x22 [Photo: NASA].

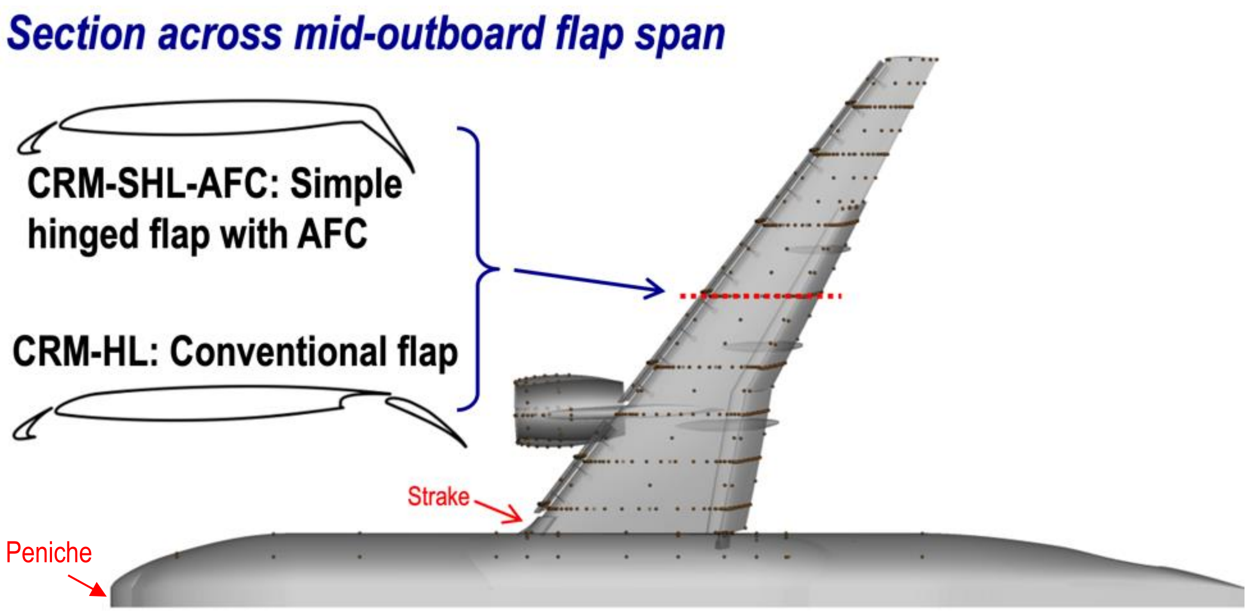
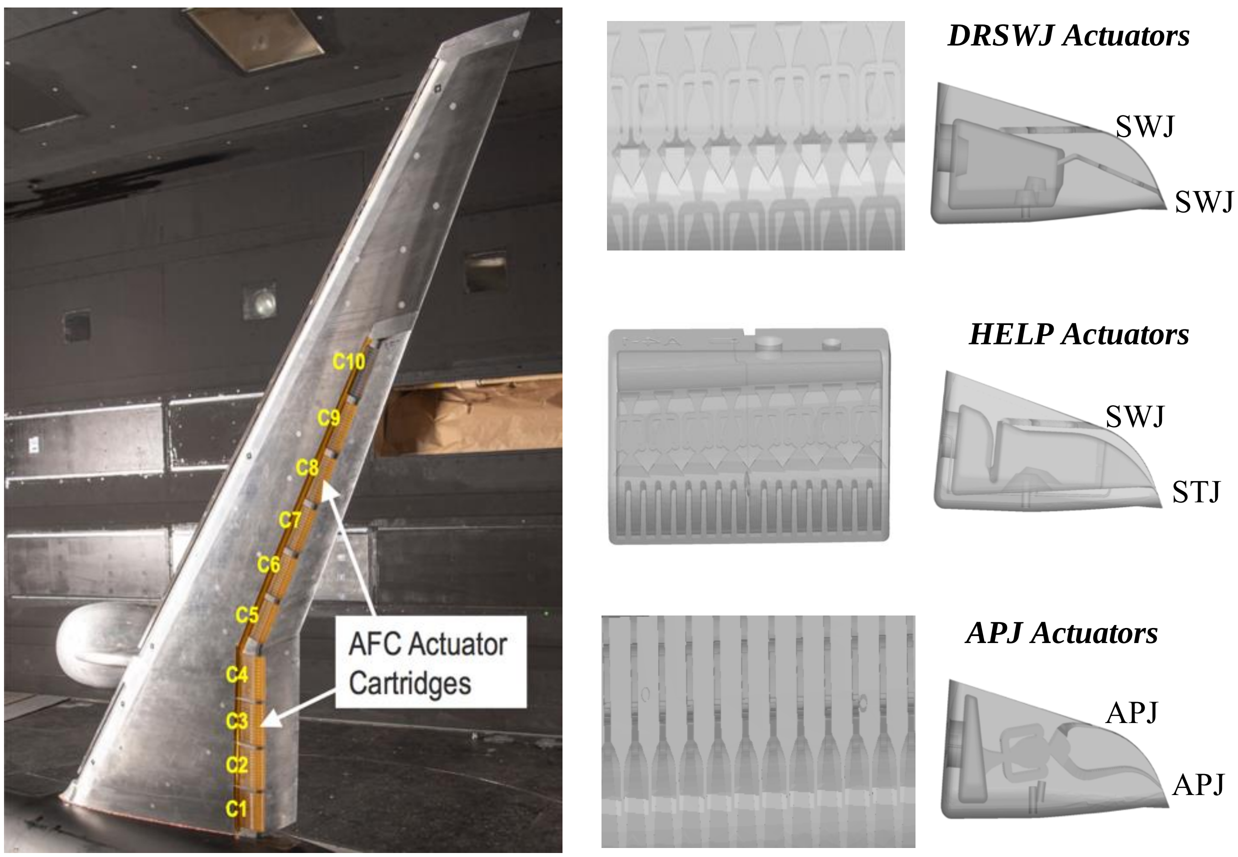


Figure 5. Cross section geometry comparison between CRM-SHL-AFC and CRM-HL.



(a) Installation of AFC cartridges [Photo: NASA].

(b) AFC cartridges.

Figure 6. AFC configurations.

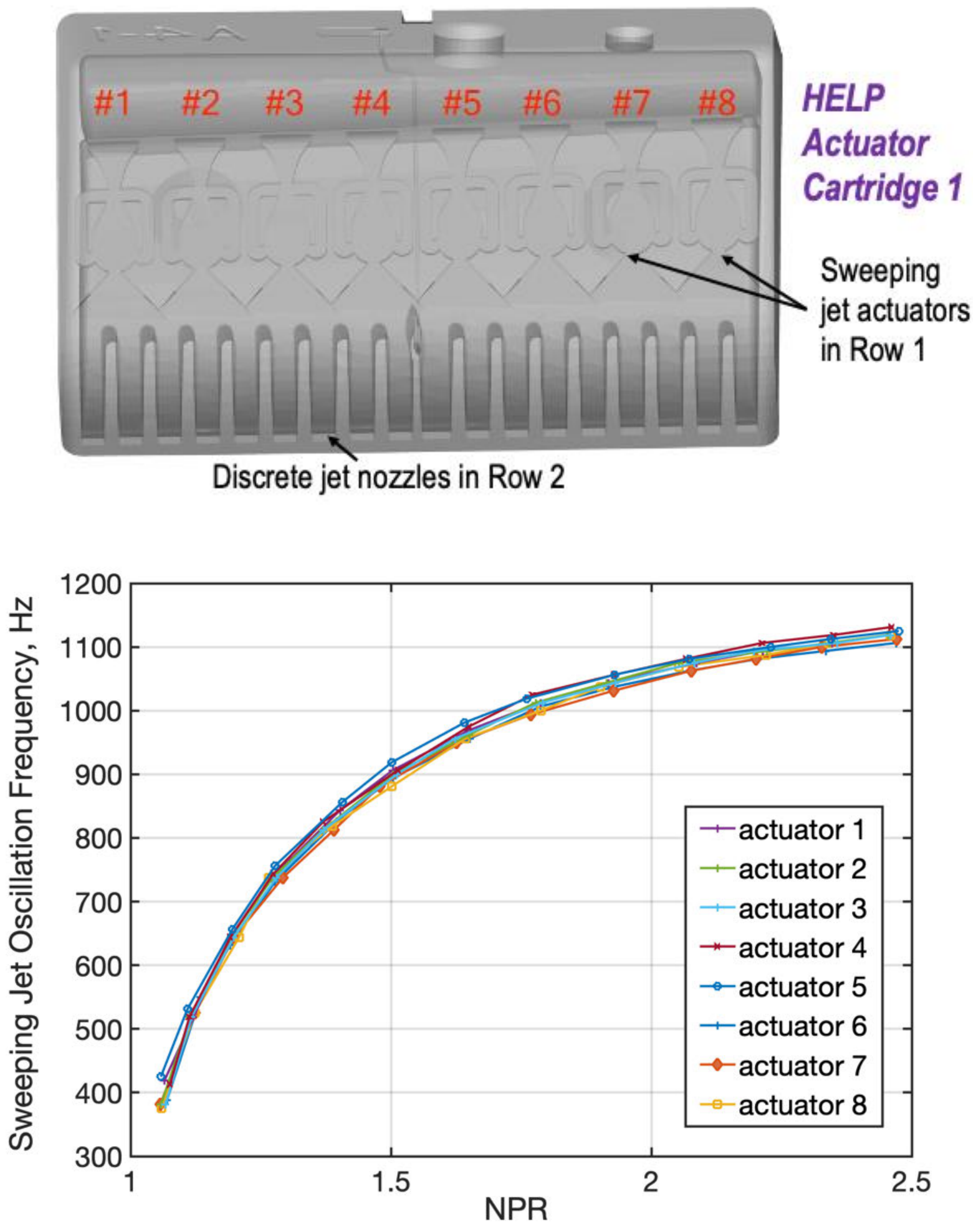
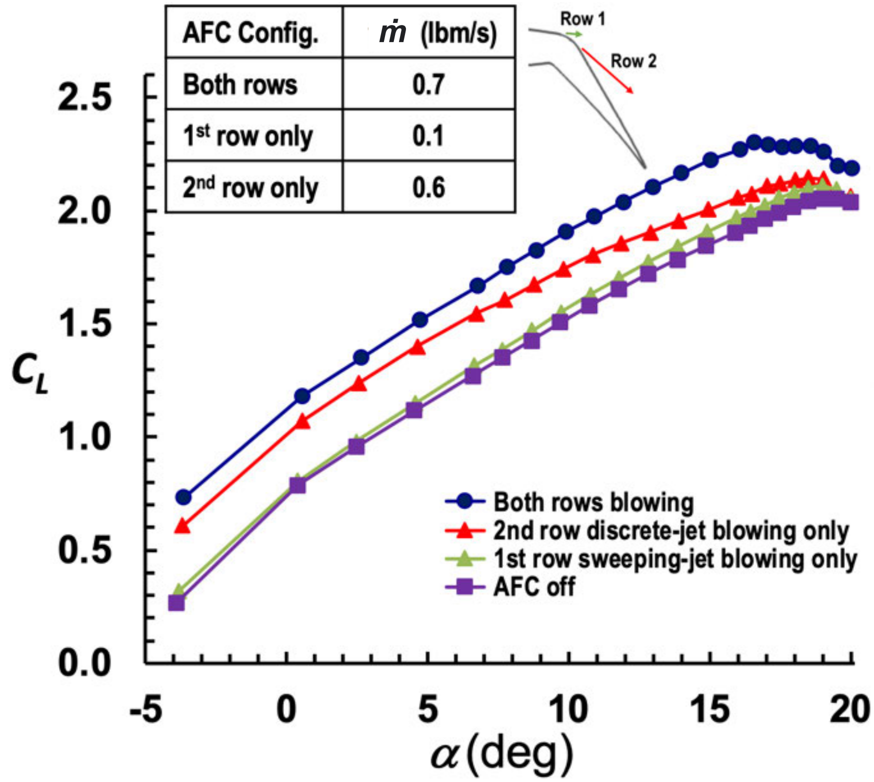
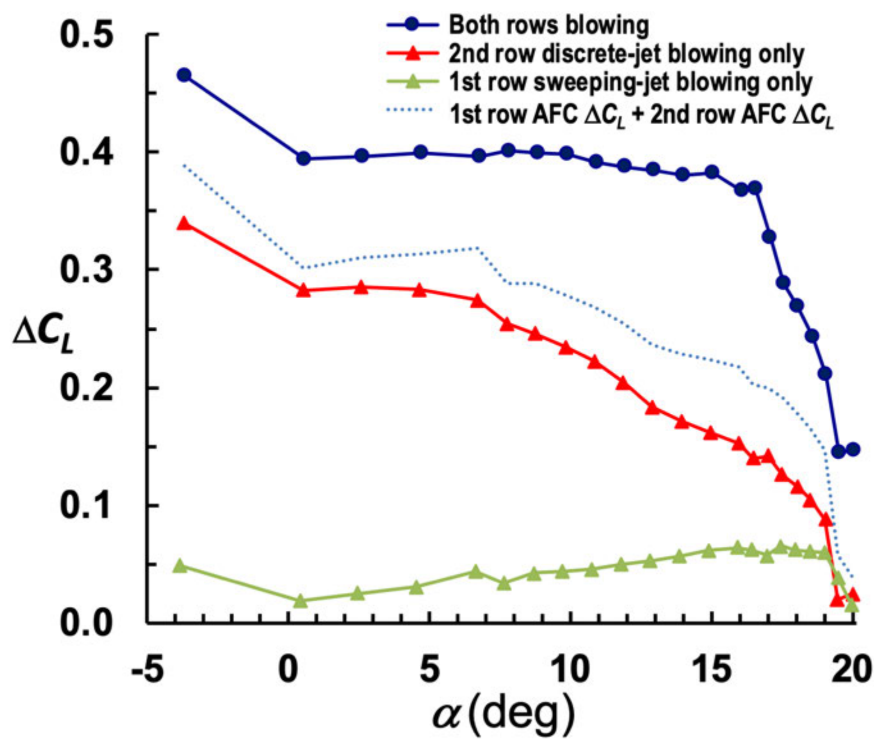


Figure 7. Frequency characteristics of the eight, Row 1 sweeping jet actuators for HELP cartridge 1 (C1).



(a) C_L vs. α



(b) ΔC_L vs. α

Figure 8. Synergistic benefit of HELP actuation between 1st and 2nd rows from Fig. 10 of Lin et al. [28] for CRM-SHL-AFC (NPR = 1.5, M_∞ = 0.2).

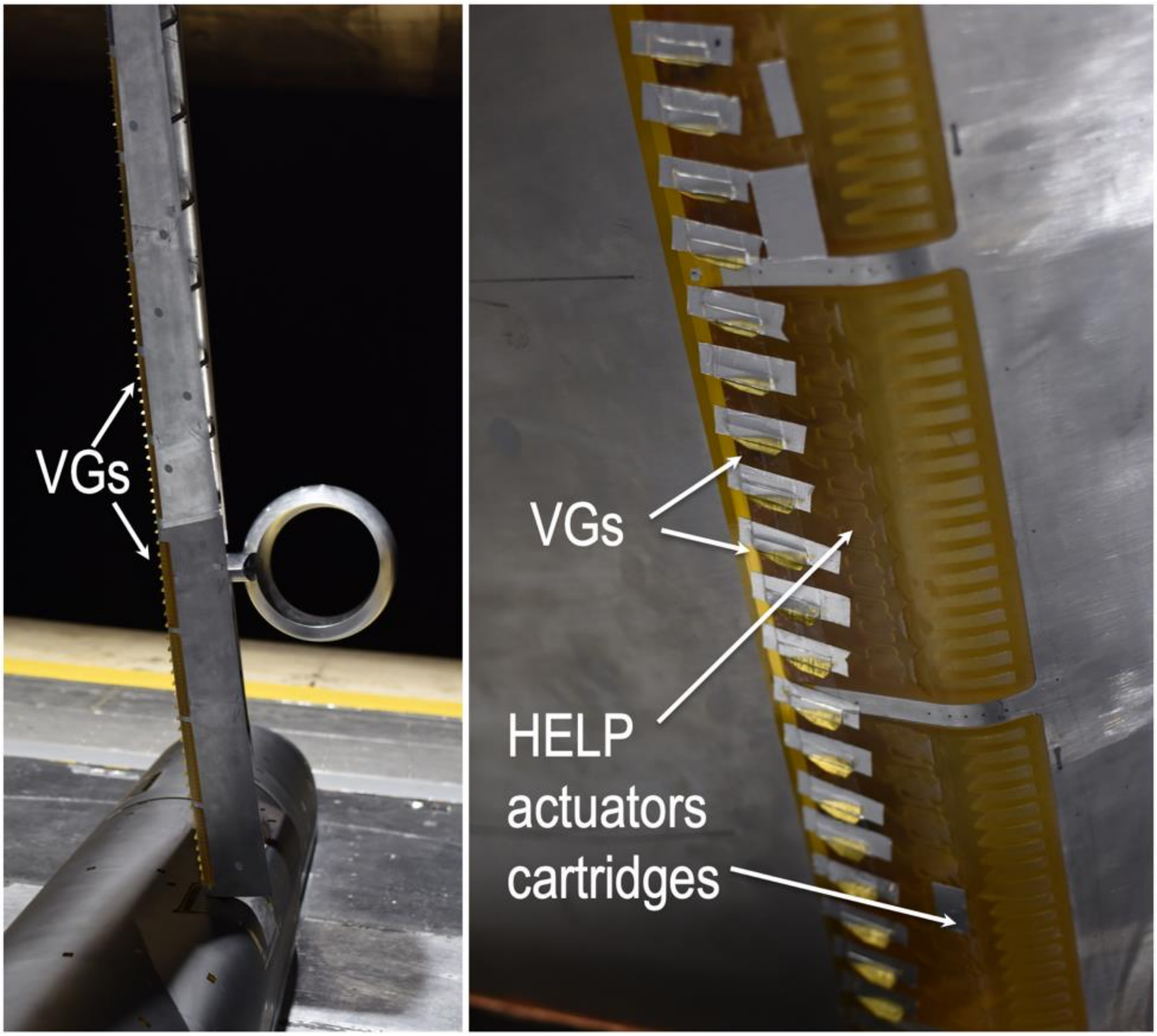


Figure 9. Co-rotating VGs on the flap shoulder (left image) and a closeup view (right image) [Photo: NASA].

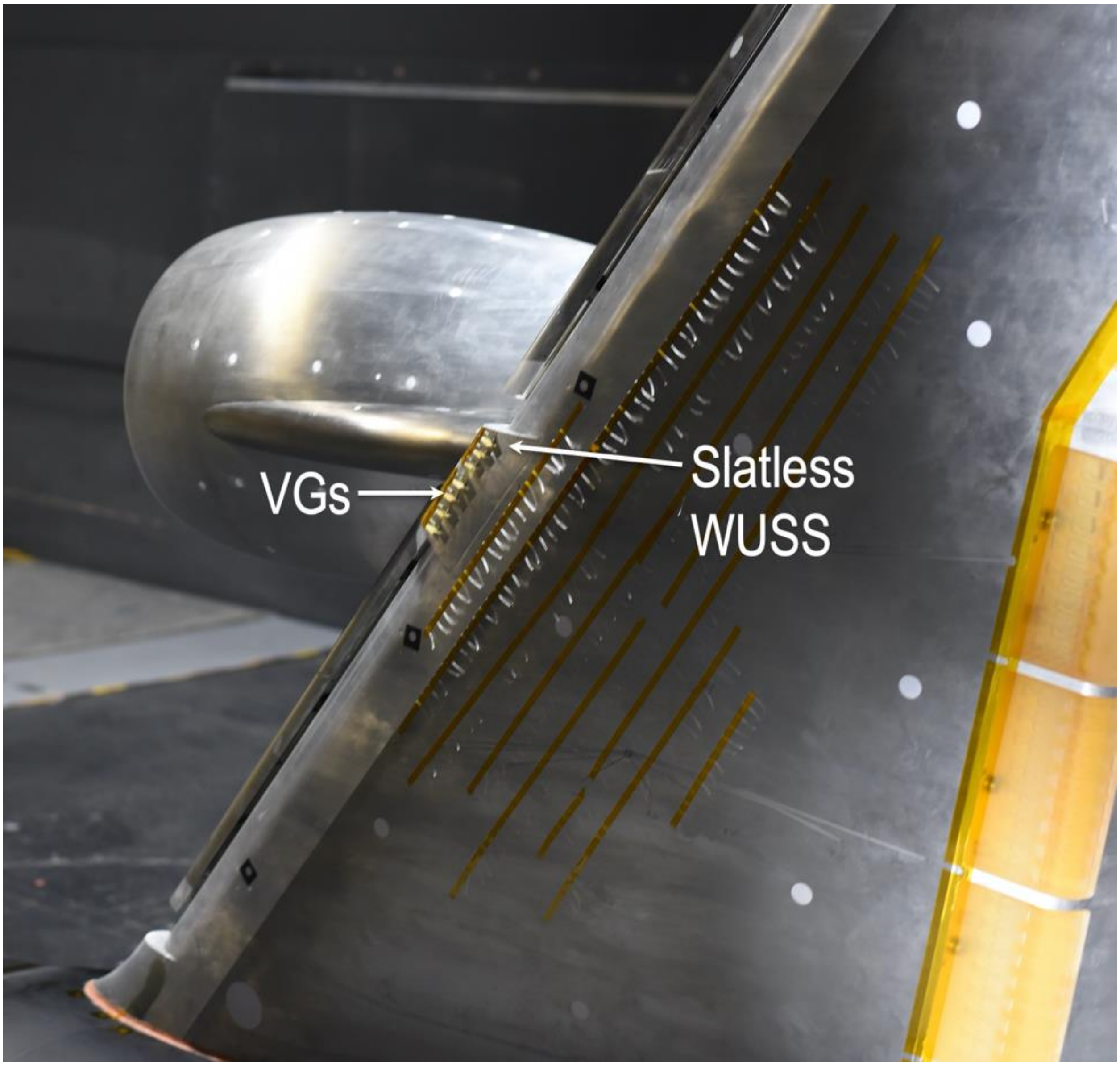
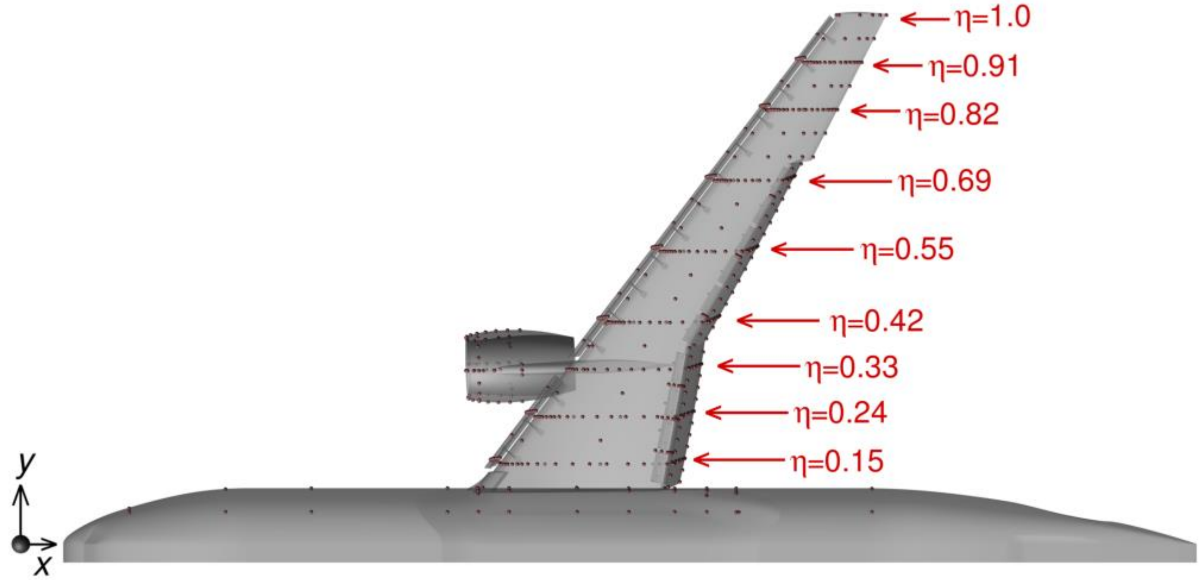
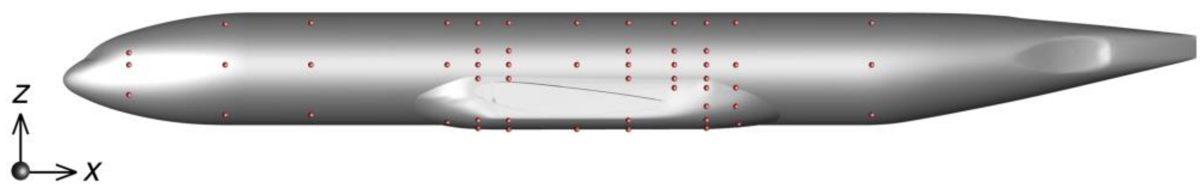


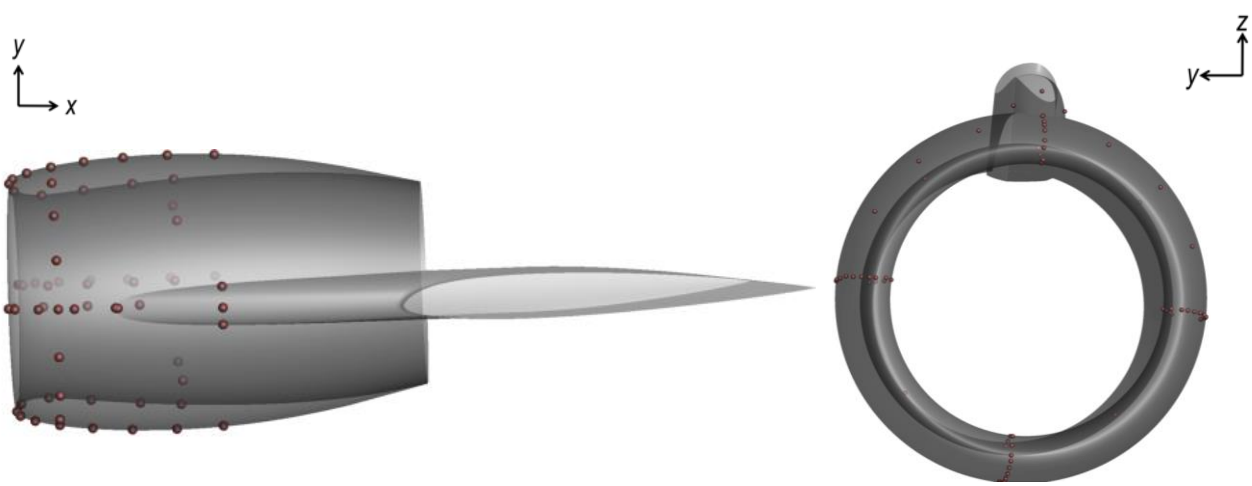
Figure 10. An image of seven co-rotating VGs on the slatless WUSS [Photo: NASA].



(a) Pressure tap layout on wing components.

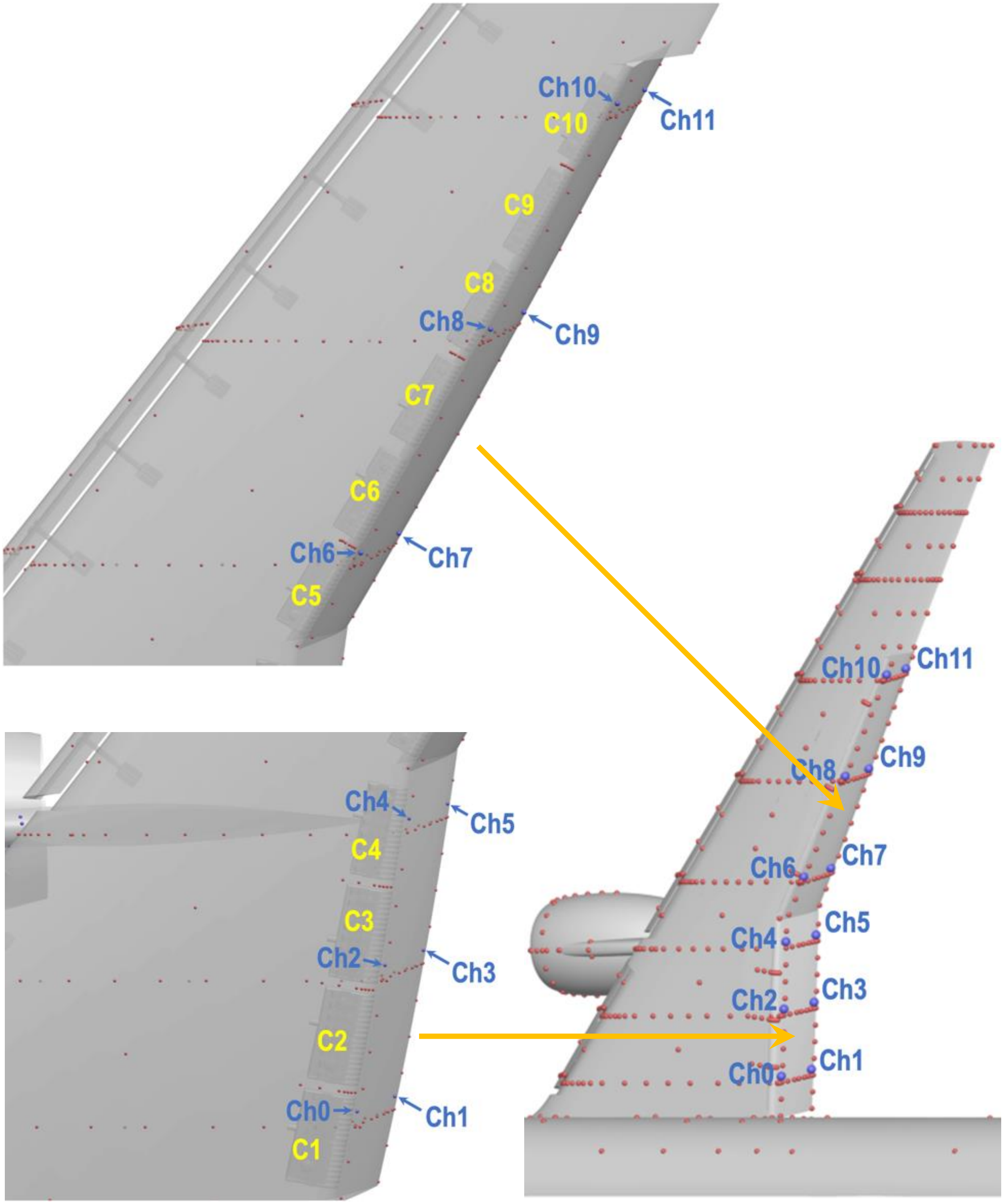


(b) Pressure tap layout on fuselage.



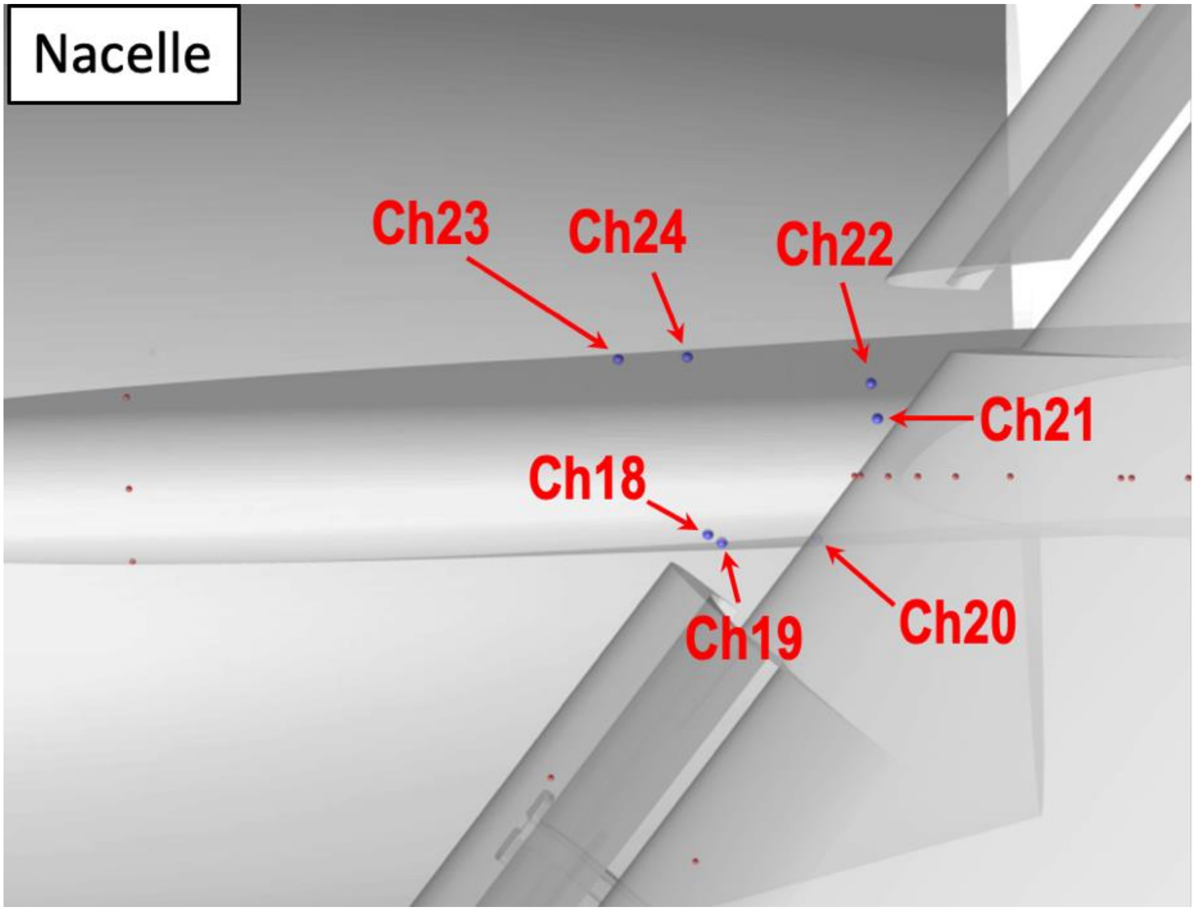
(c) Pressure tap layout on nacelle.

Figure 11. CRM-SHL-AFC pressure port layout. Origin of coordinate system shown by (●) in (a) and (b).

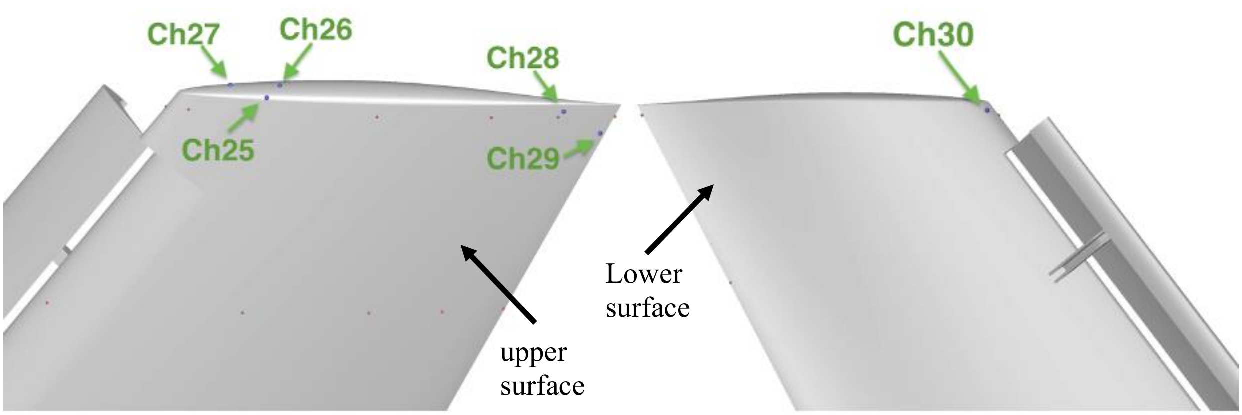


(a) Sensor locations (Ch0-Ch11) on the simple-hinged flaps with close-up views showing their position relative to the actuator cartridges (C1-C10).

Figure 12. Unsteady pressure transducer locations (blue dots in the images) on the simple-hinged flaps, pylon, and wingtip.



(b) Sensor locations on the pylon.



(c) Sensor locations on the wingtip.

Figure 12. Concluded.

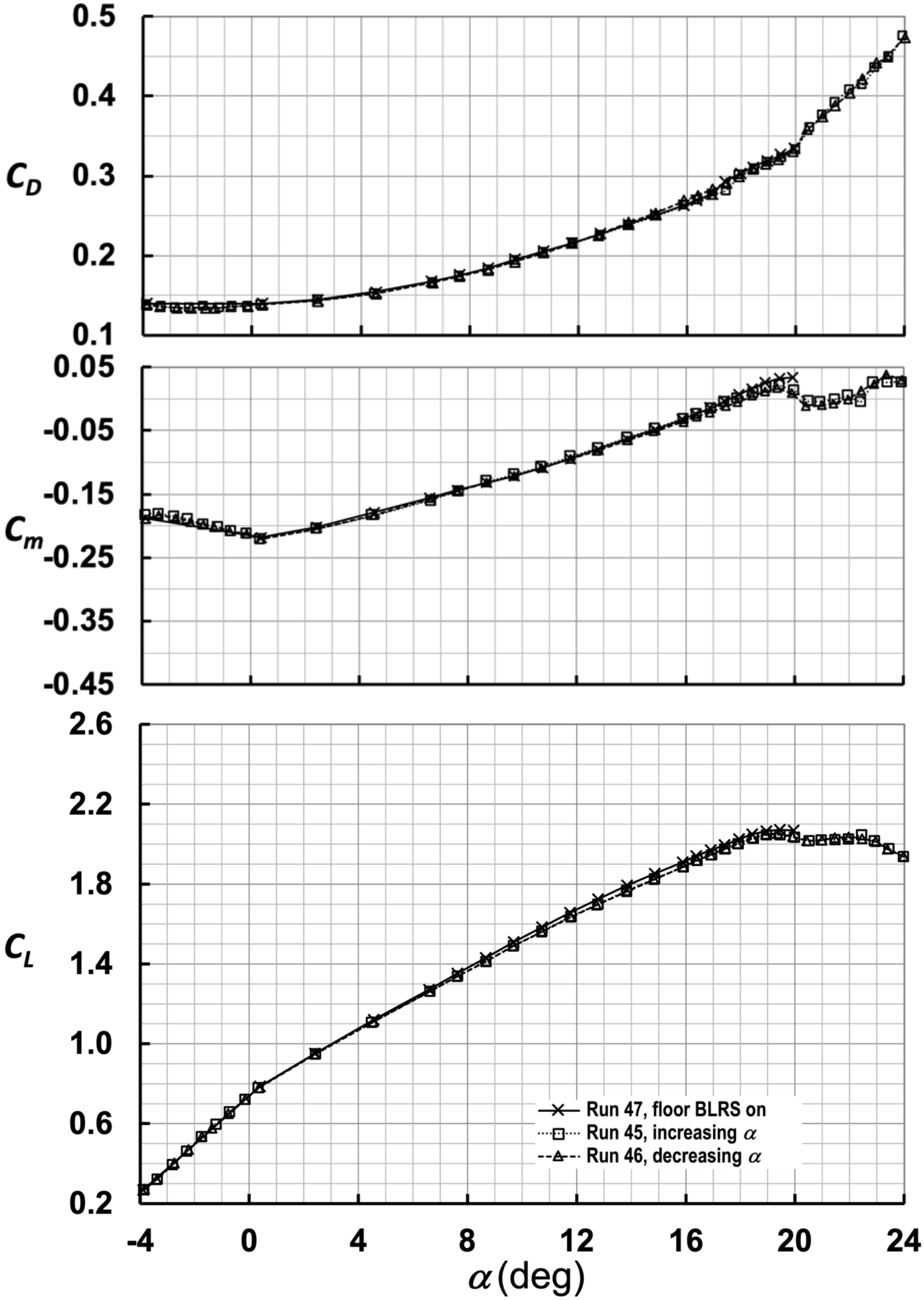


Figure 13. C_D, C_m and C_L vs. α plots for increasing/decreasing α and with floor BLRS on (Preliminary checkout runs; AFC-off, $M_\infty = 0.2$, with TWICS).

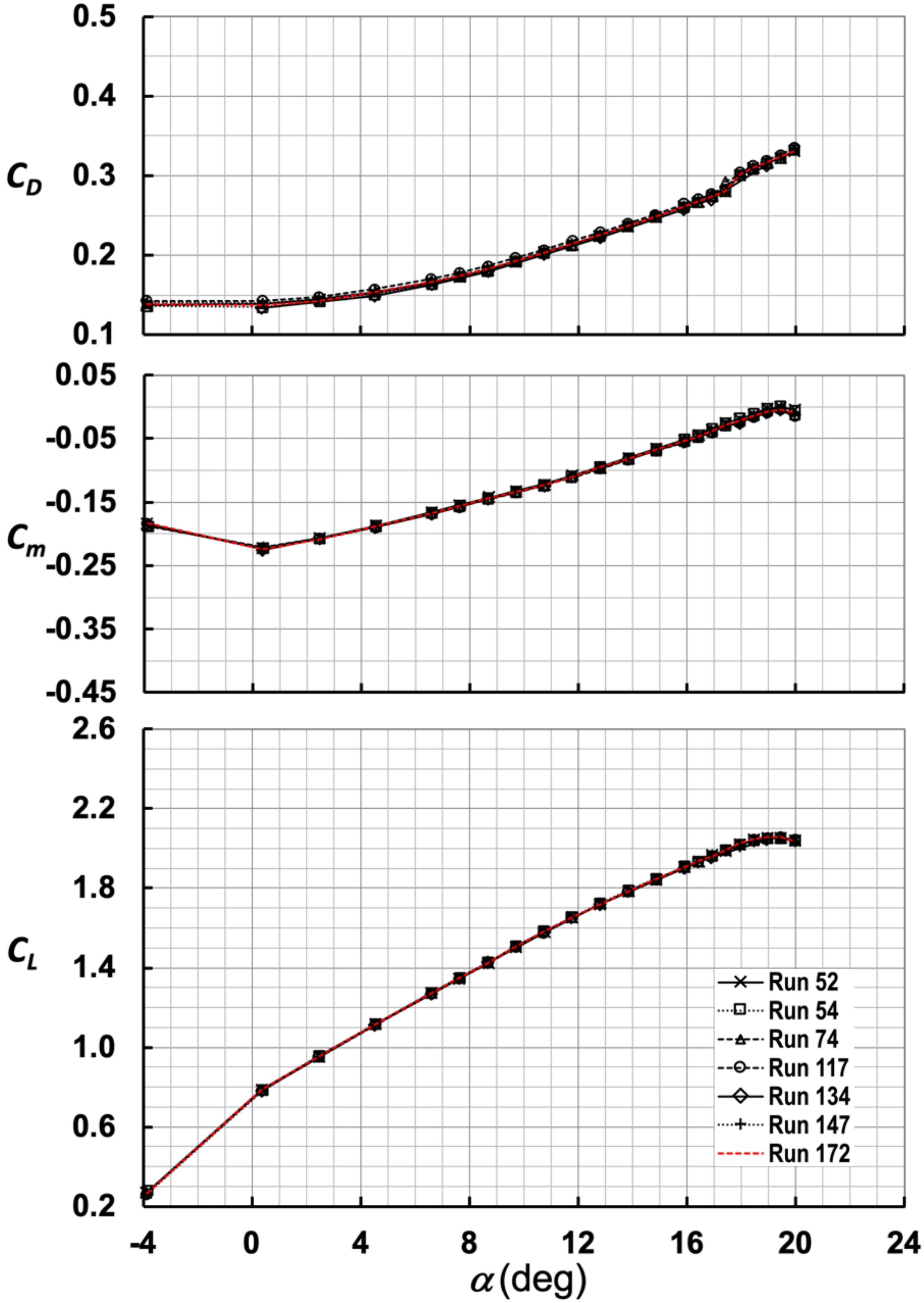


Figure 14. C_D, C_m and C_L vs. α plots for repeat runs without AFC (AFC-off; $M_\infty = 0.2$, with TWICS).

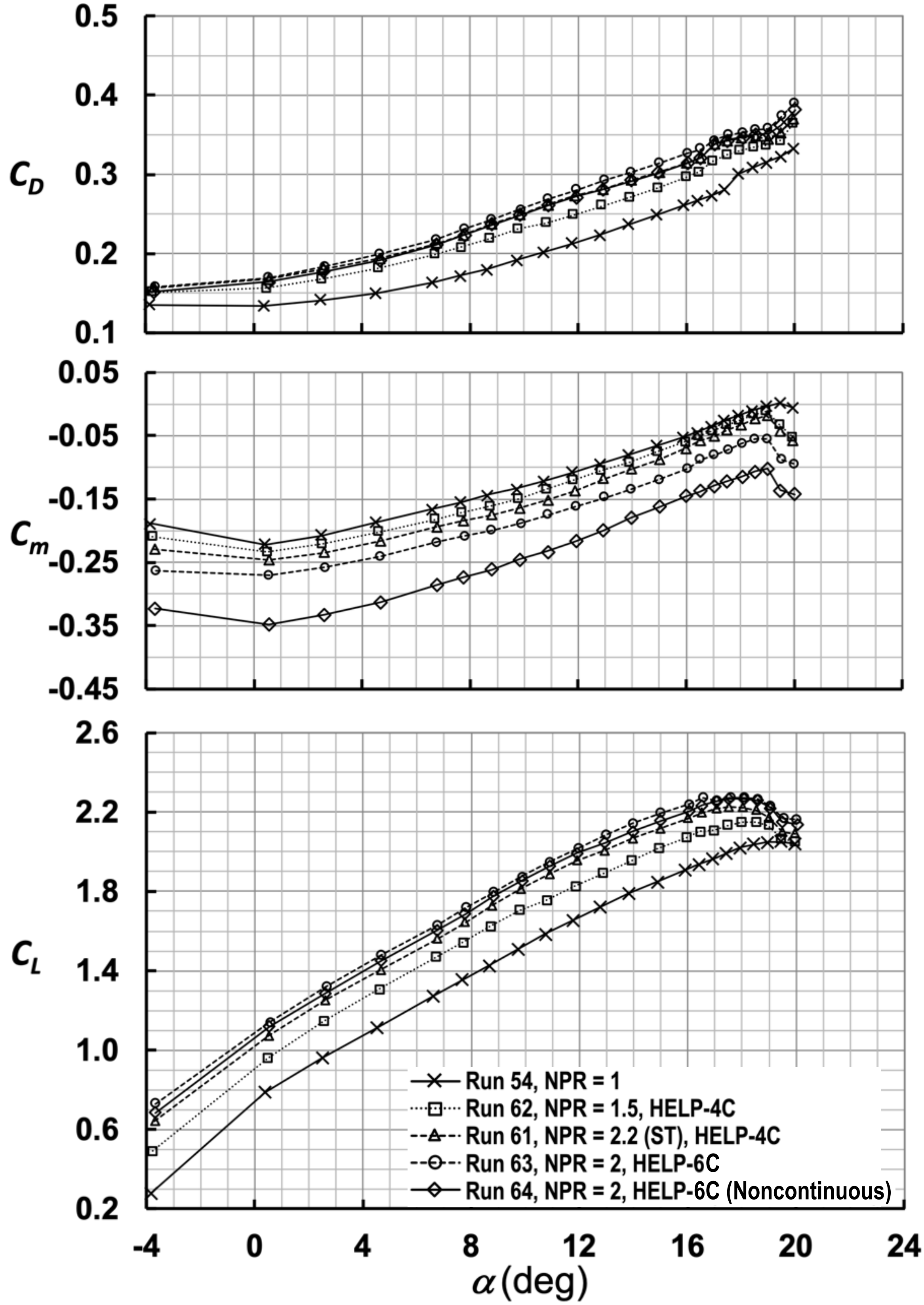


Figure 15. C_D, C_m and C_L vs. α plots for HELP actuators with 4- or 6-cartridge partial coverage (HELP-4C, HELP-6C; $M_\infty = 0.2$, with TWICS).

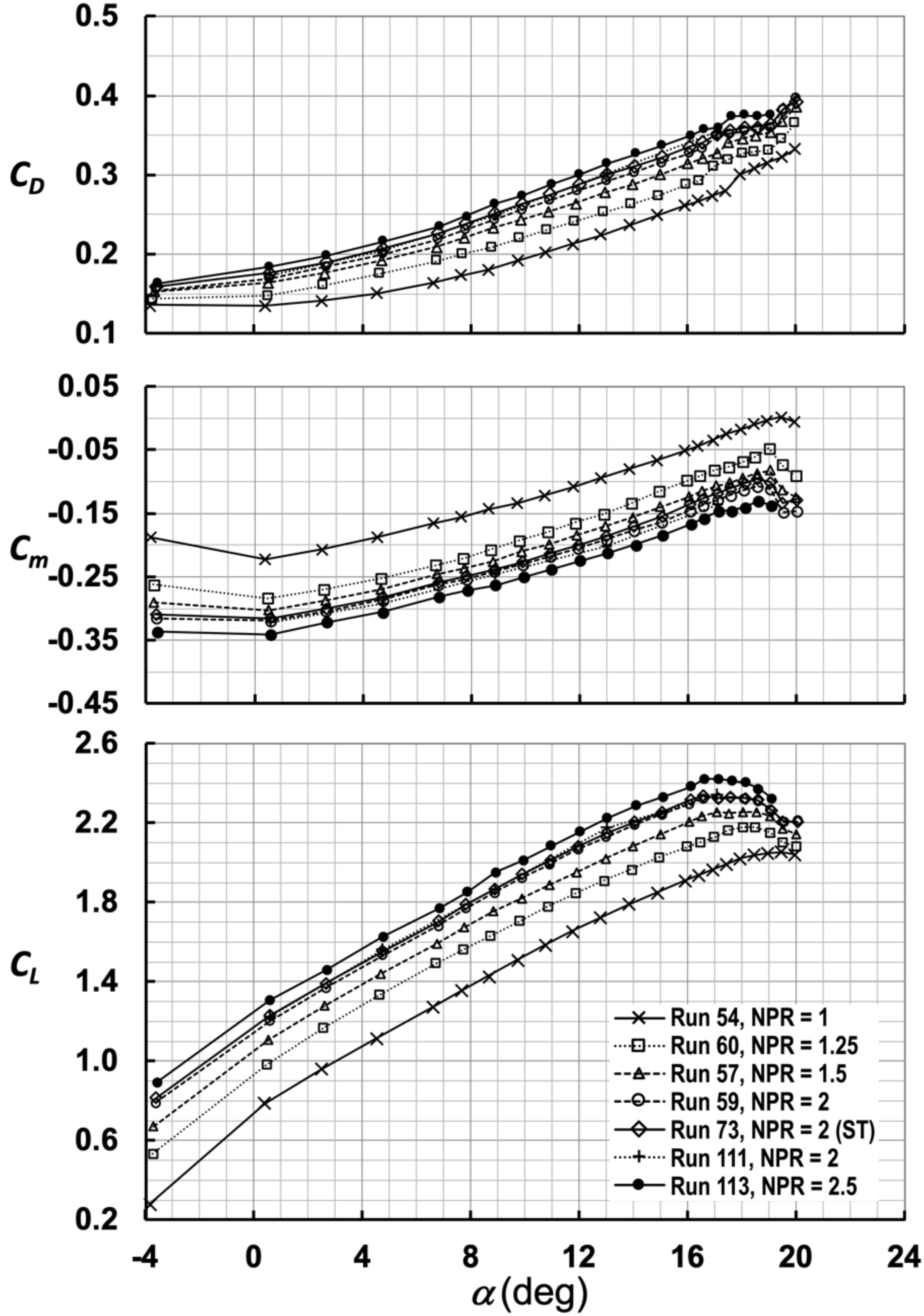


Figure 16. C_D, C_m and C_L vs. α plots for HELP actuators with 8-cartridge partial coverage (HELP-8C, HELP-8C^; $M_\infty = 0.2$, with TWICS).

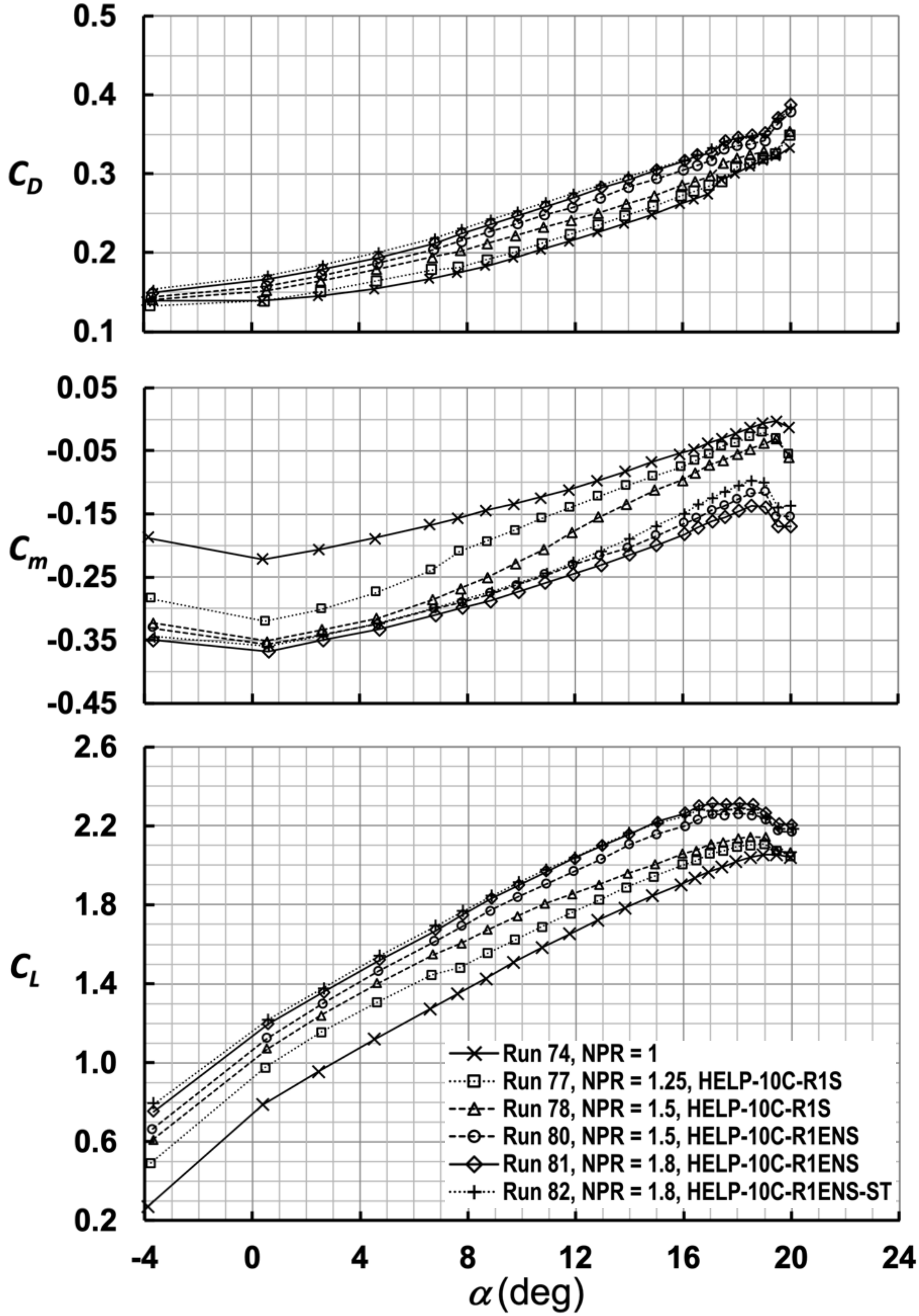


Figure 17. C_D, C_m and C_L vs. α plots for full-coverage HELP actuators with Row 1 (sweeping jets) sealed (HELP-10C-R1S, HELP-10C-R1ENS; $M_\infty = 0.2$, with TWICS).

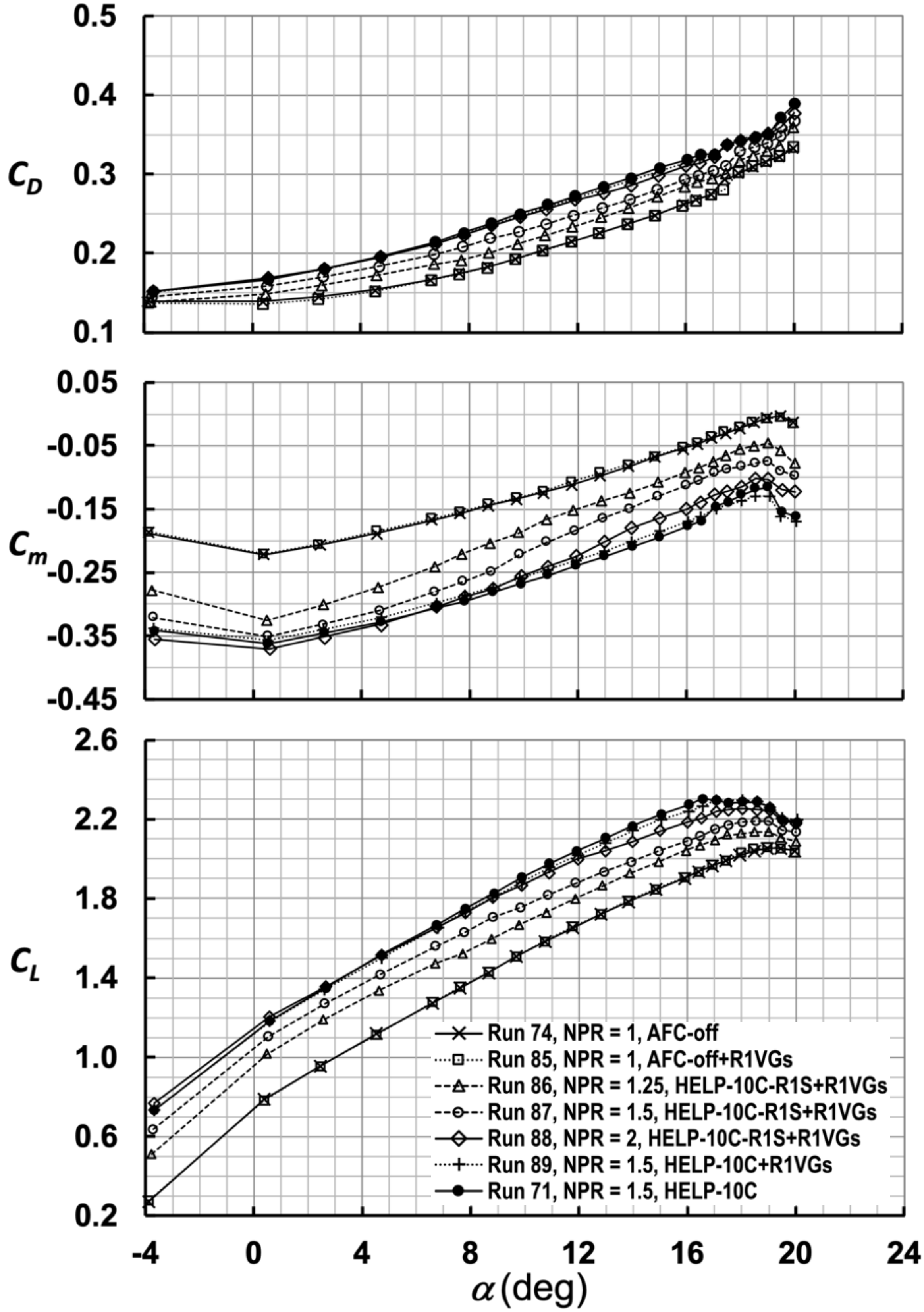


Figure 18. C_D, C_m and C_L vs. α plots for full-coverage HELP actuators with 79 VGs installed upstream of Row 1 sweeping jets (HELP-10C-R1S+R1VGs, HELP-10C+R1VGs; $M_\infty = 0.2$, with TWICS).

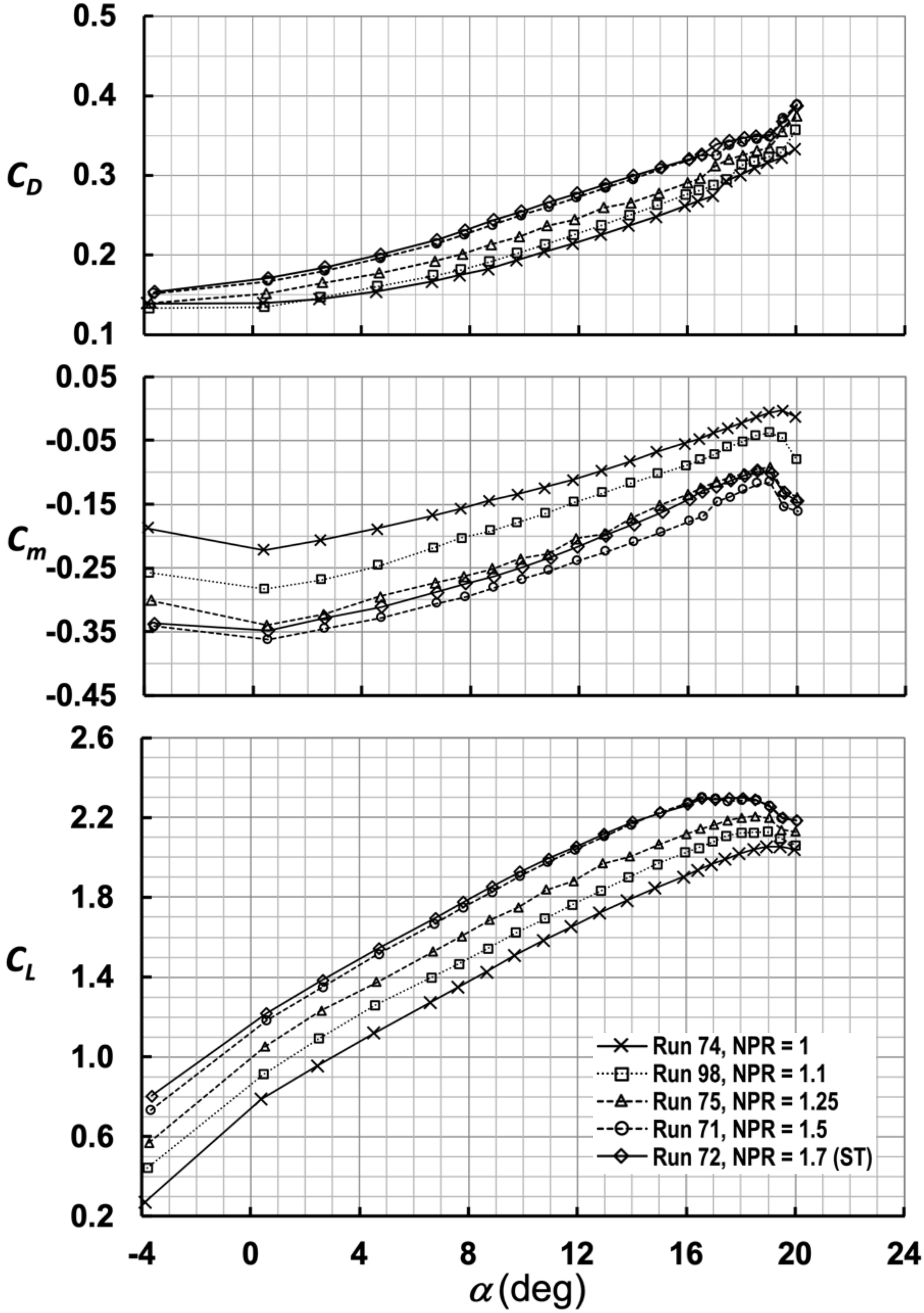


Figure 19. C_D, C_m and C_L vs. α plots for full-coverage HELP actuators (HELP-10C; NPR ≤ 1.7, $M_\infty = 0.2$, with TWICS).

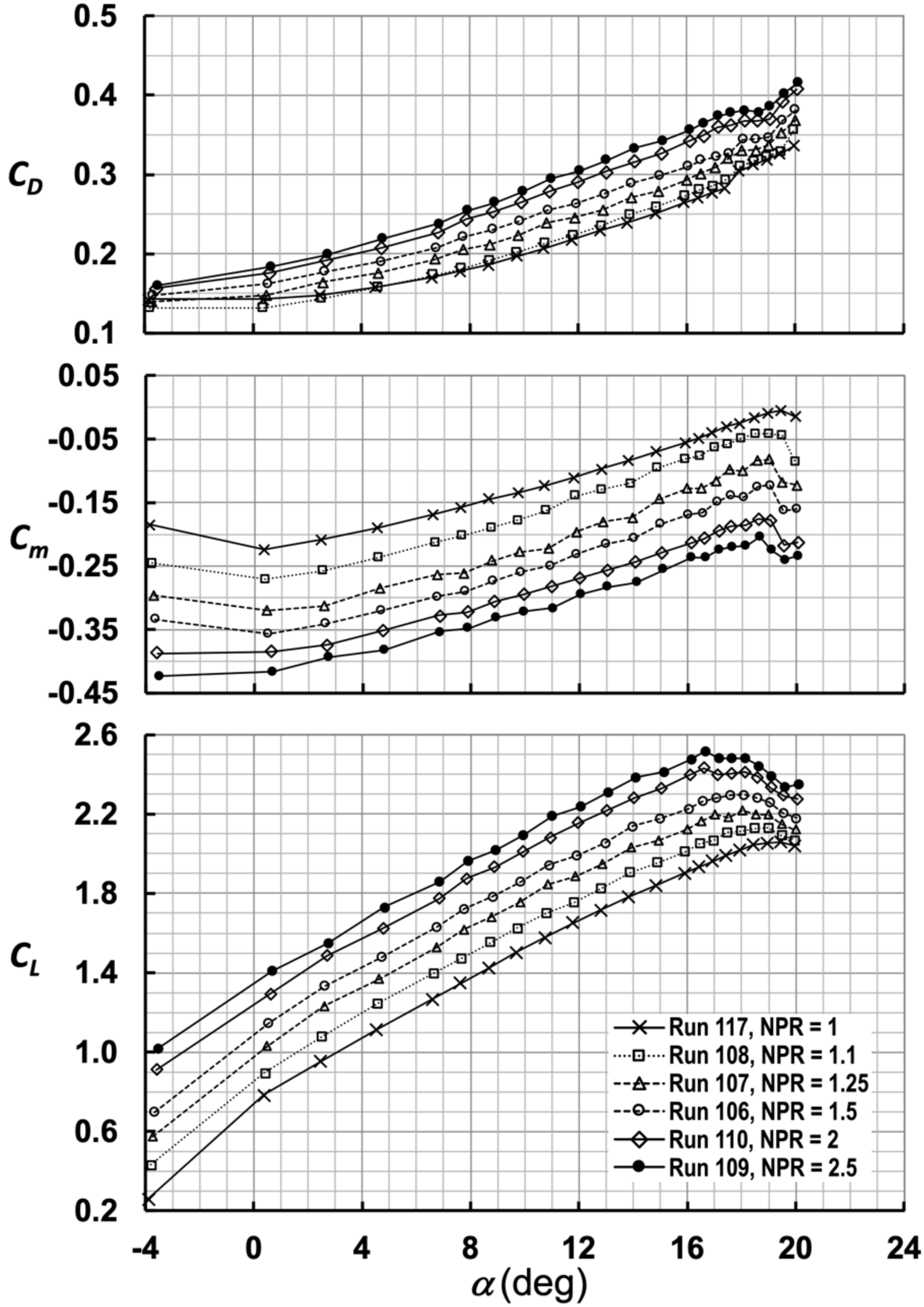


Figure 20. C_D, C_m and C_L vs. α plots for full-coverage HELP actuators (HELP-10C^; $M_\infty = 0.2$, with TWICS).

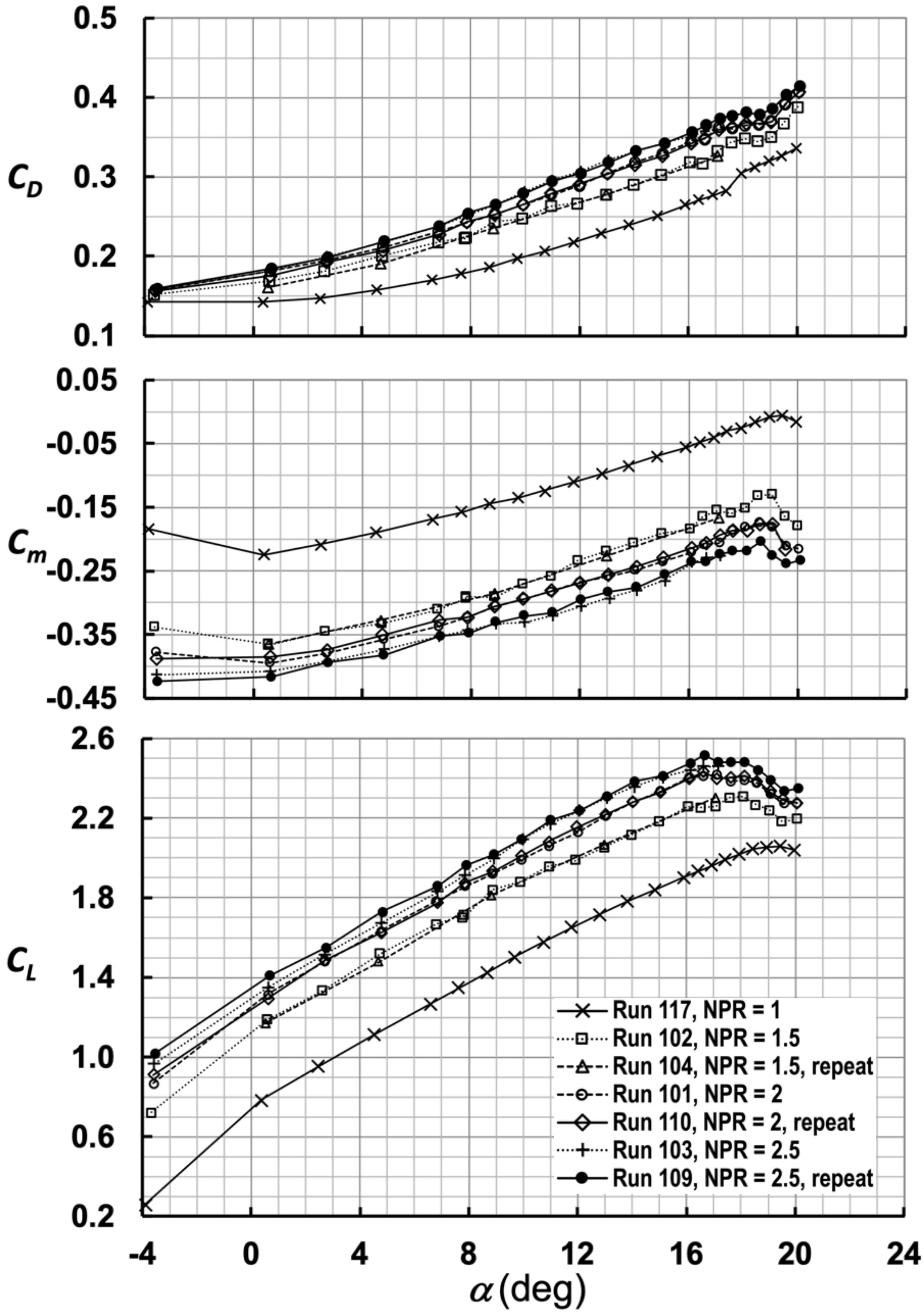


Figure 21. C_D, C_m and C_L vs. α plots for full-coverage HELP actuators, including repeat runs (HELP-10C^; $M_\infty = 0.2$, with TWICS).

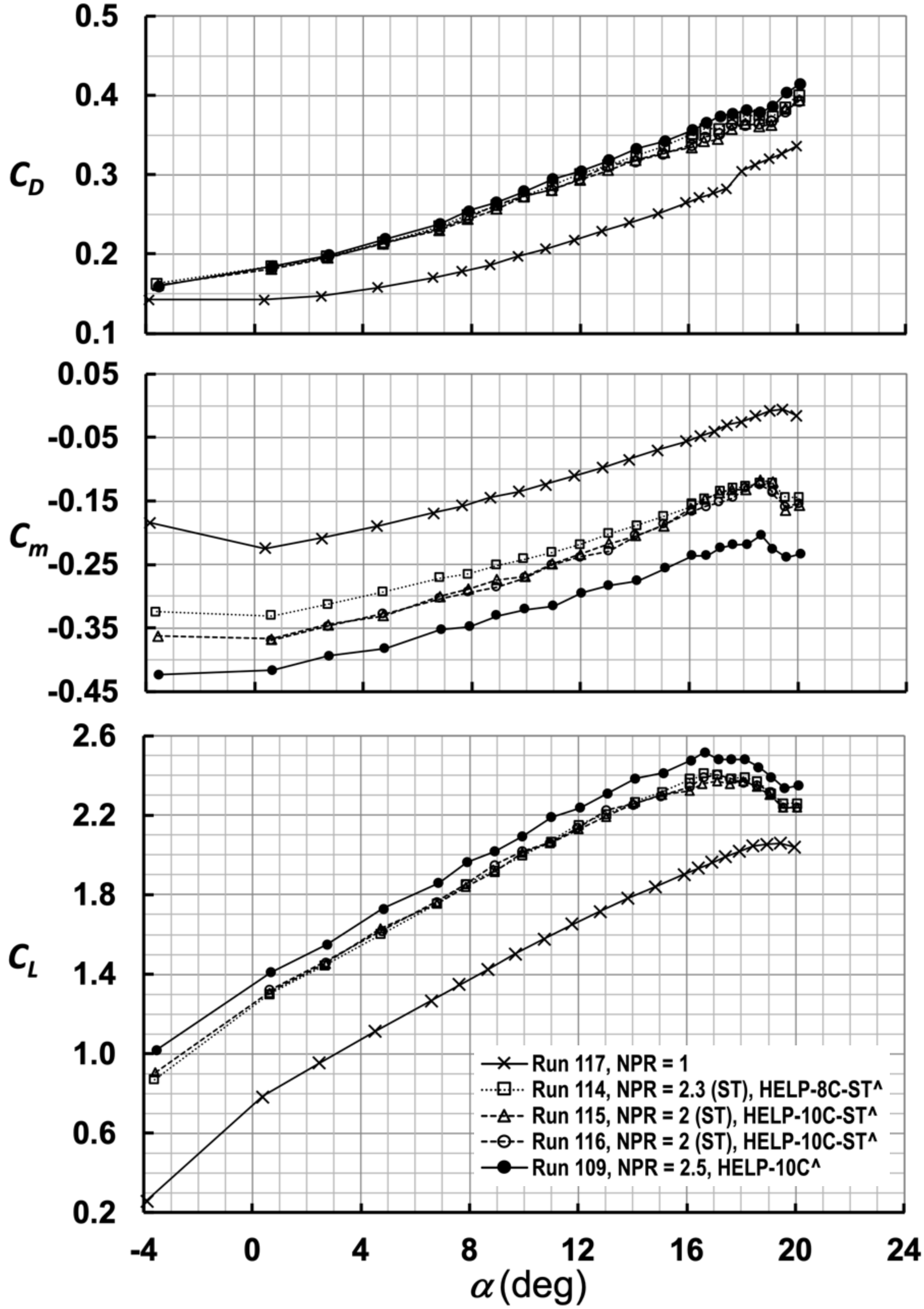


Figure 22. C_D, C_m and C_L vs. α plots for full- and partial- coverage HELP actuators at various spanwise tailoring NPR (HELP-10C-ST^, HELP-8C-ST^; $M_\infty = 0.2$, with TWICS).

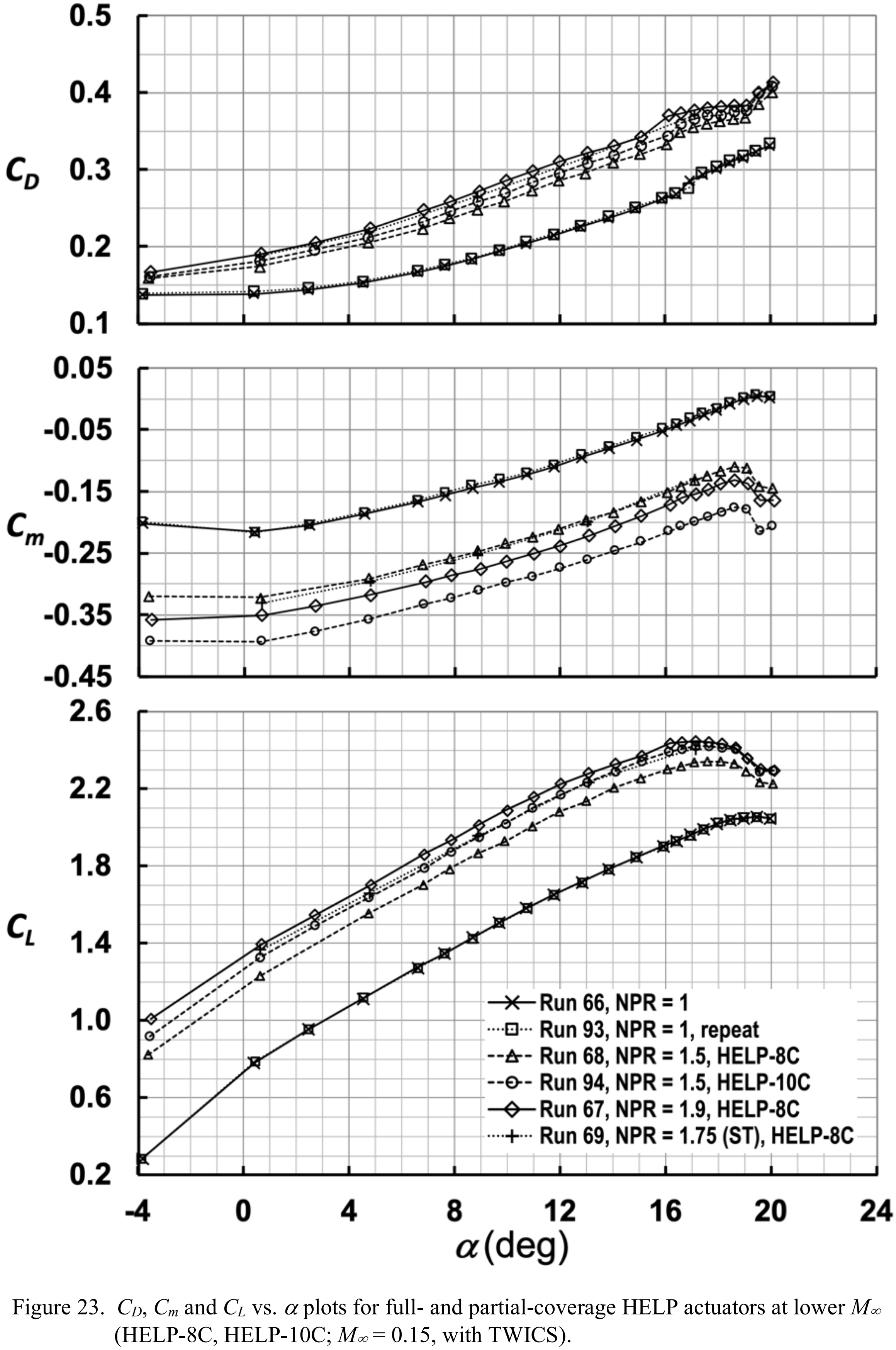


Figure 23. C_D, C_m and C_L vs. α plots for full- and partial-coverage HELP actuators at lower M_∞ (HELP-8C, HELP-10C; $M_\infty = 0.15$, with TWICS).

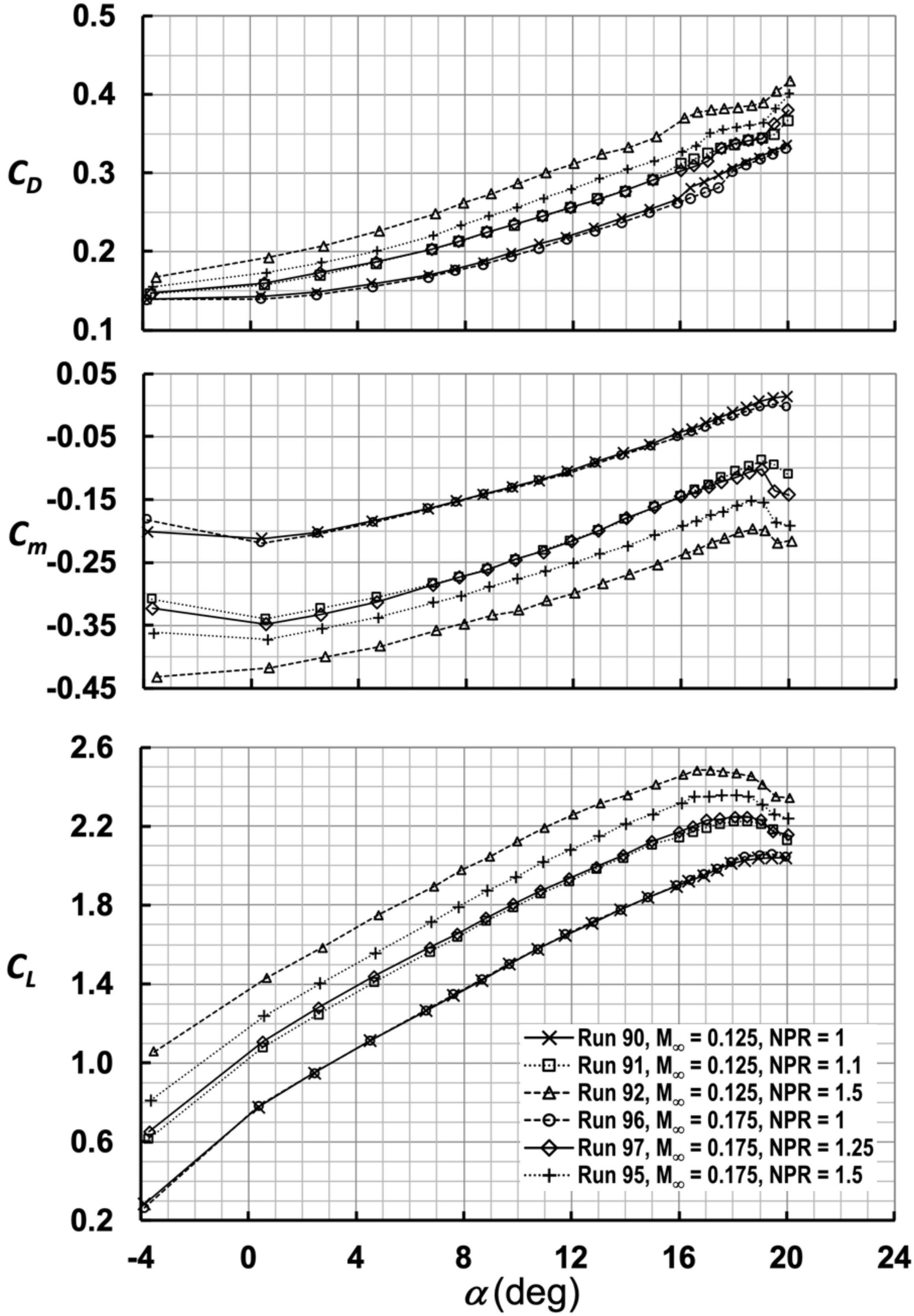


Figure 24. C_D, C_m and C_L vs. α plots for full-coverage HELP actuators at lower M_∞ (HELP-10C; $M_\infty = 0.125$ and $M_\infty = 0.175$, with TWICS).

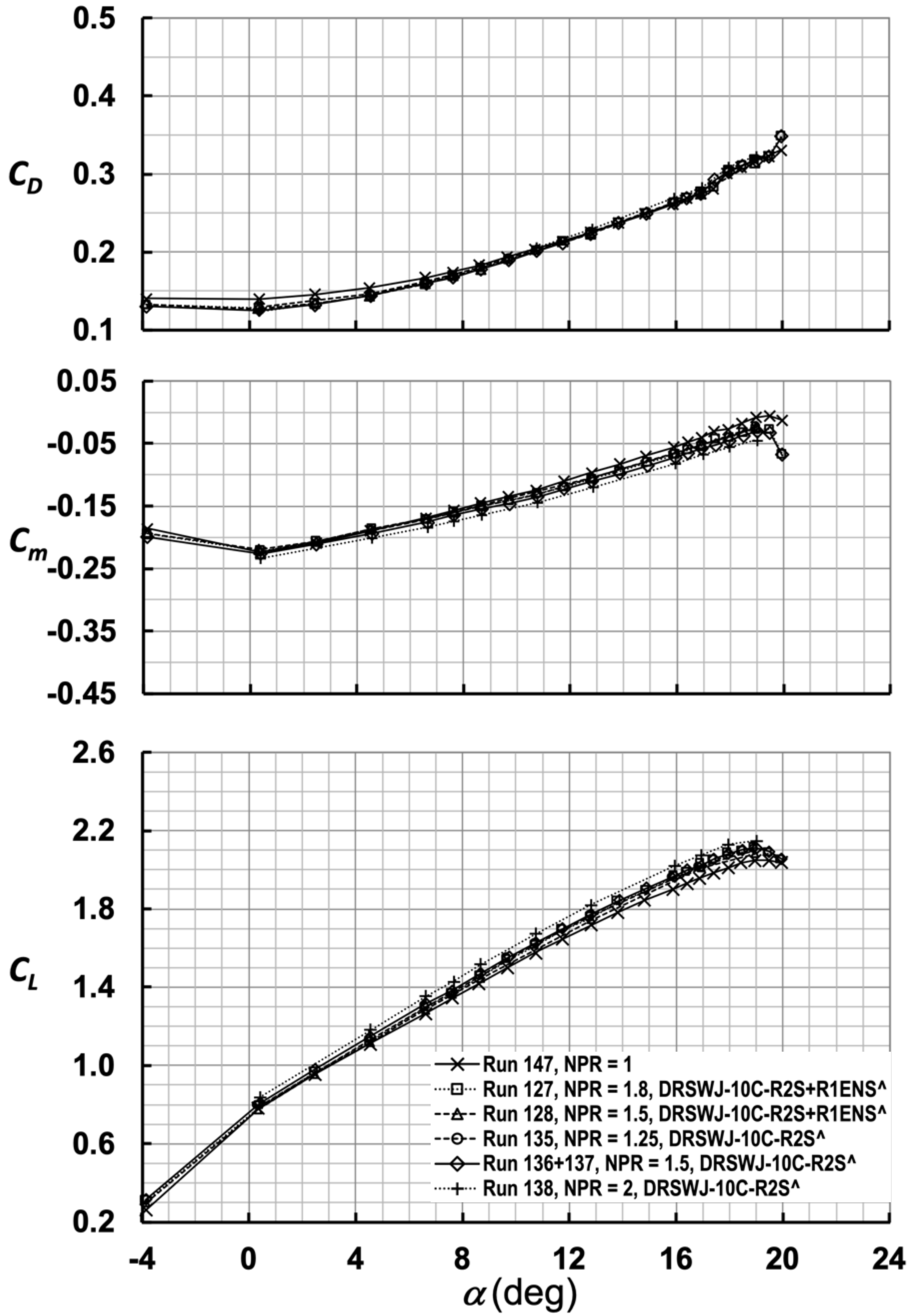


Figure 25. C_D, C_m and C_L vs. α plots for full-coverage DRSWJ actuators with various nozzles sealed (DRSWJ-10C-R2S+R1ENS^, DRSWJ-10C-R2S^; $M_\infty = 0.2$, with TWICS).

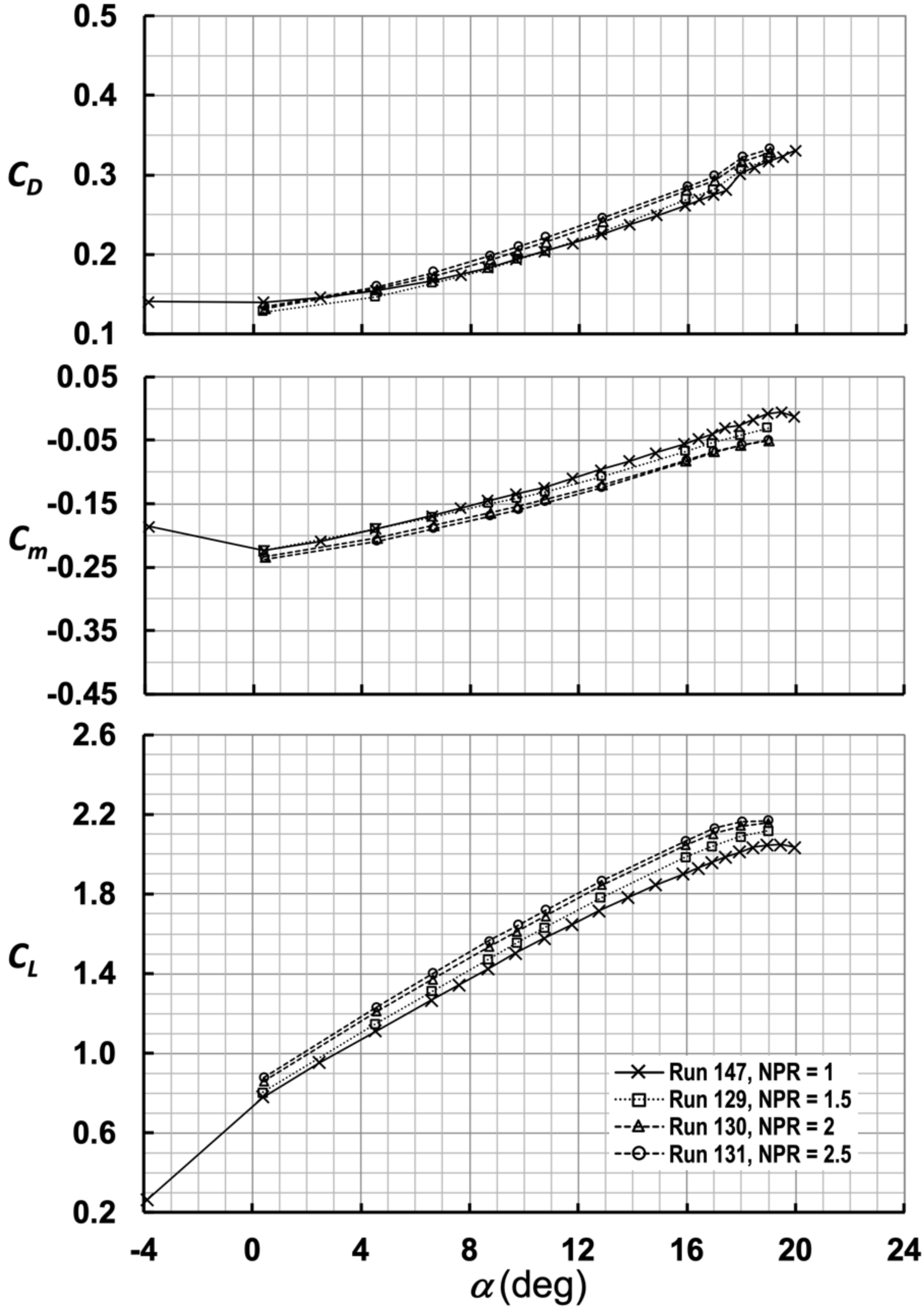


Figure 26. C_D, C_m and C_L vs. α plots for full-coverage DRSWJ actuators with all even nozzles sealed (DRSWJ-10C-ENS^; $M_\infty = 0.2$, with TWICS).

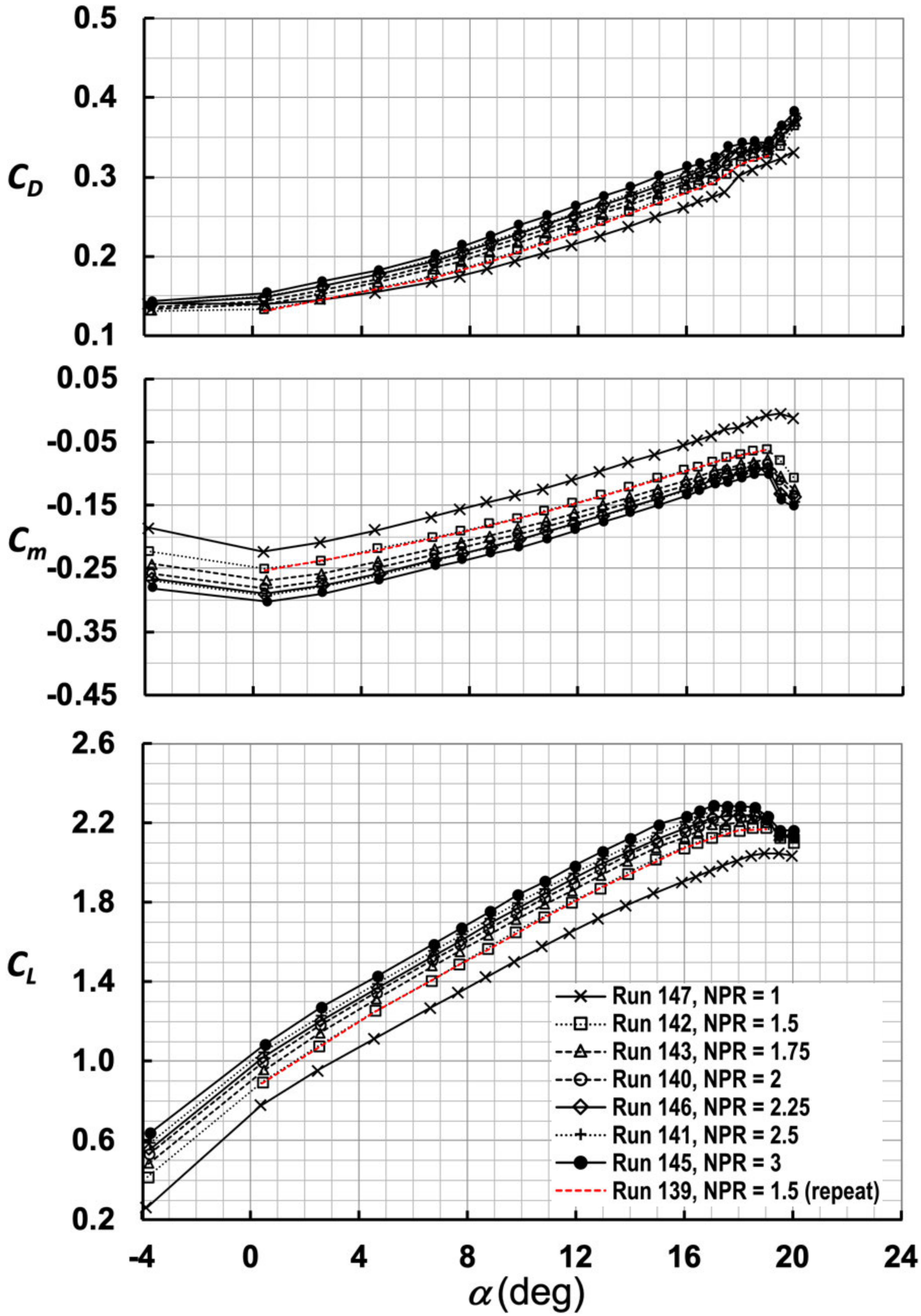


Figure 27. C_D, C_m and C_L vs. α plots for full-coverage DRSWJ actuators (DRSWJ-10C^; M_∞ = 0.2, with TWICS).

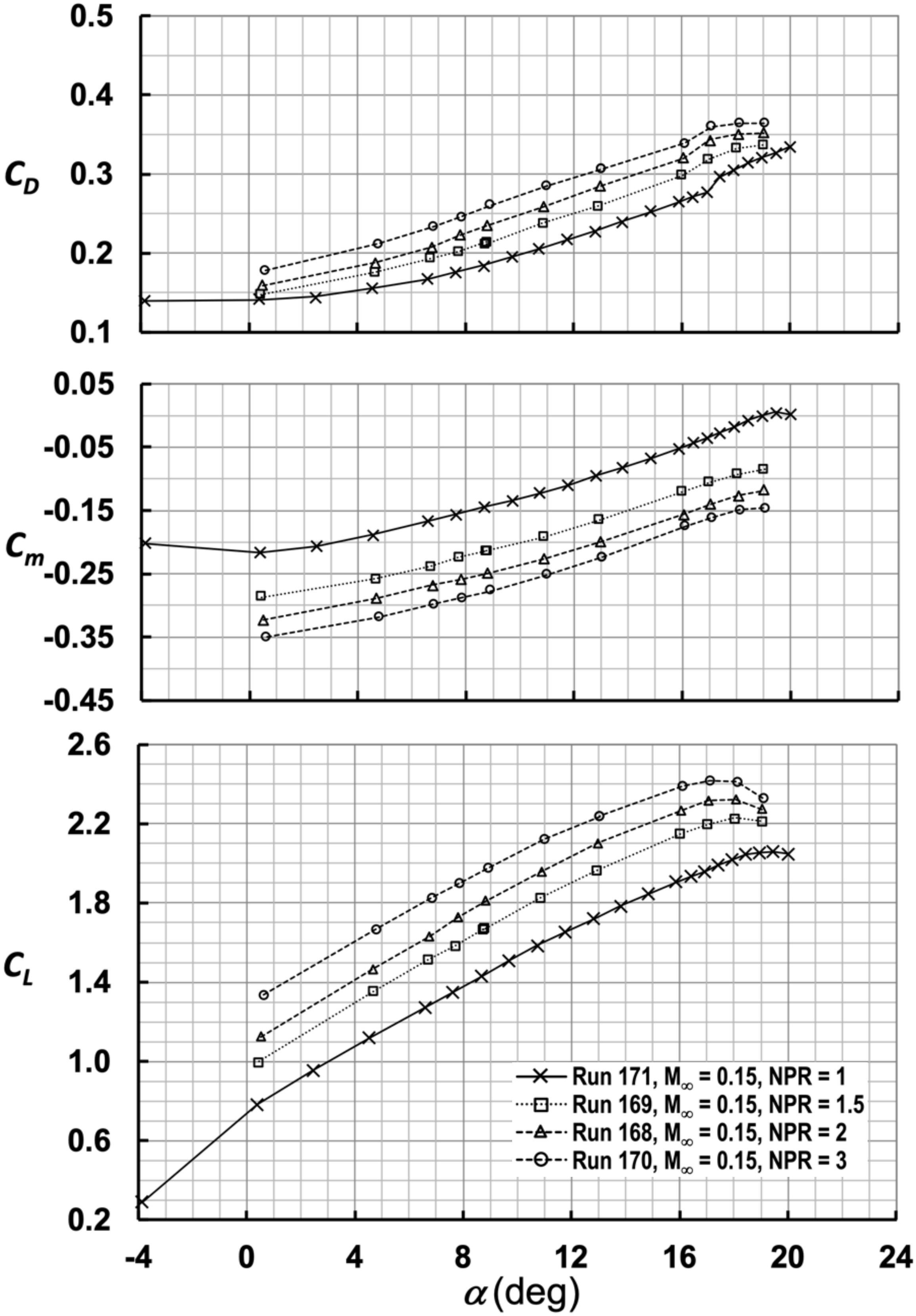


Figure 28. C_D, C_m and C_L vs. α plots for full-coverage DRSWJ actuators at lower M_∞ (DRSWJ-10C^; $M_\infty = 0.15$, with TWICS).

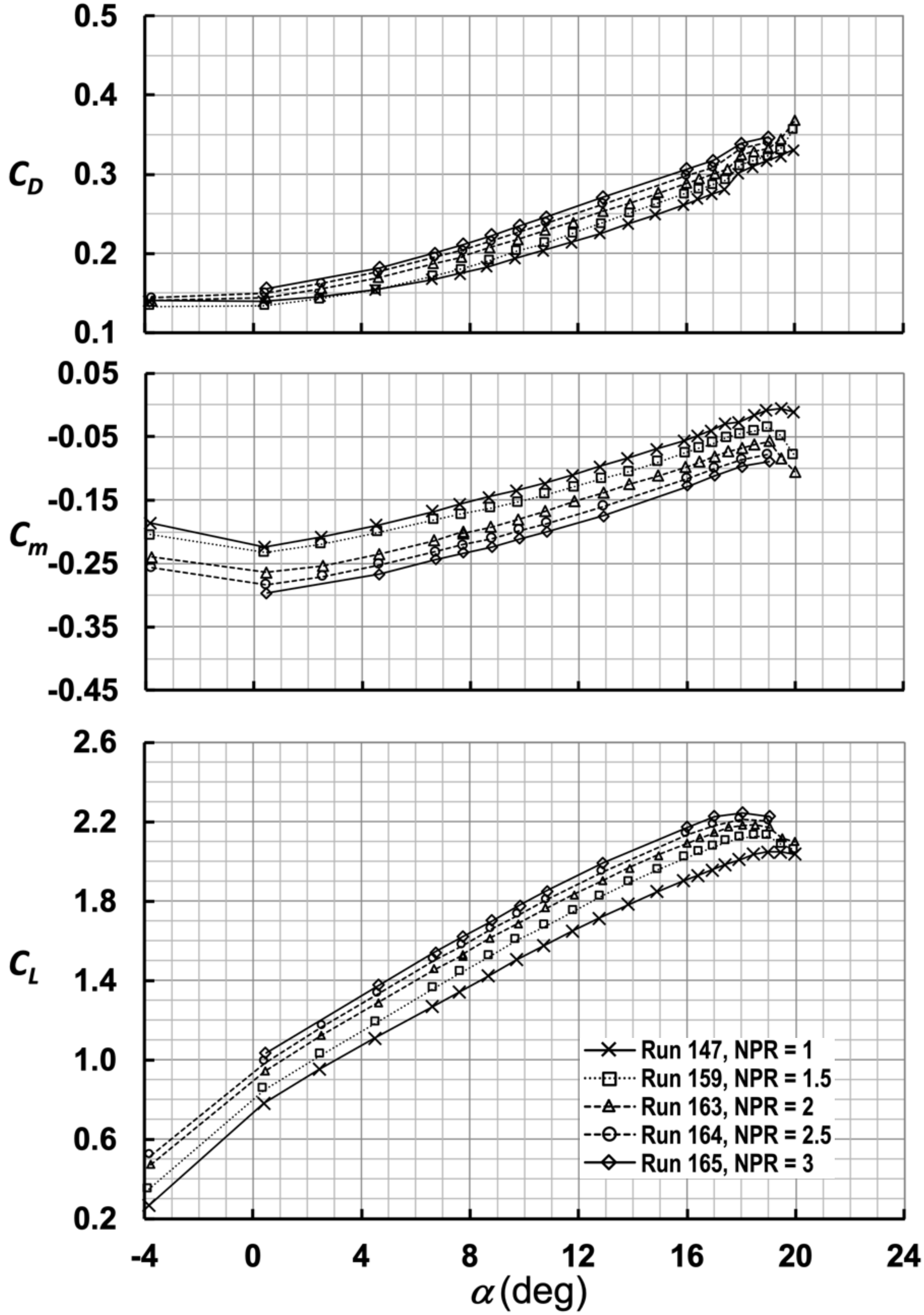


Figure 29. C_D, C_m and C_L vs. α plots for full-coverage APJ actuators (APJ-10C^; $M_\infty = 0.2$, with TWICS).

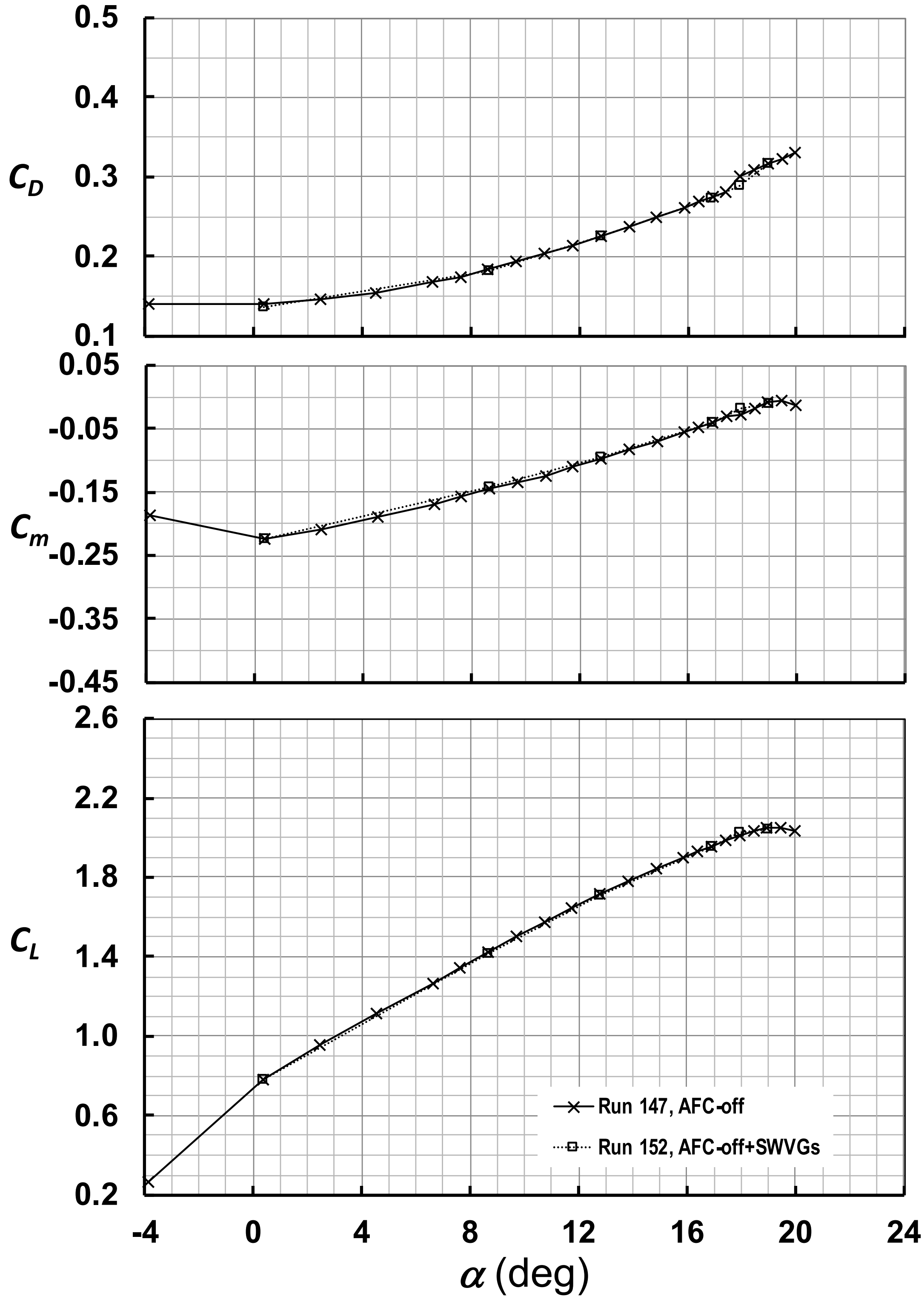


Figure 30. C_D, C_m and C_L vs. α plots for VGs installed downstream of pylon (AFC-off+SWVGs; NPR = 1, $M_\infty = 0.2$, with TWICS).

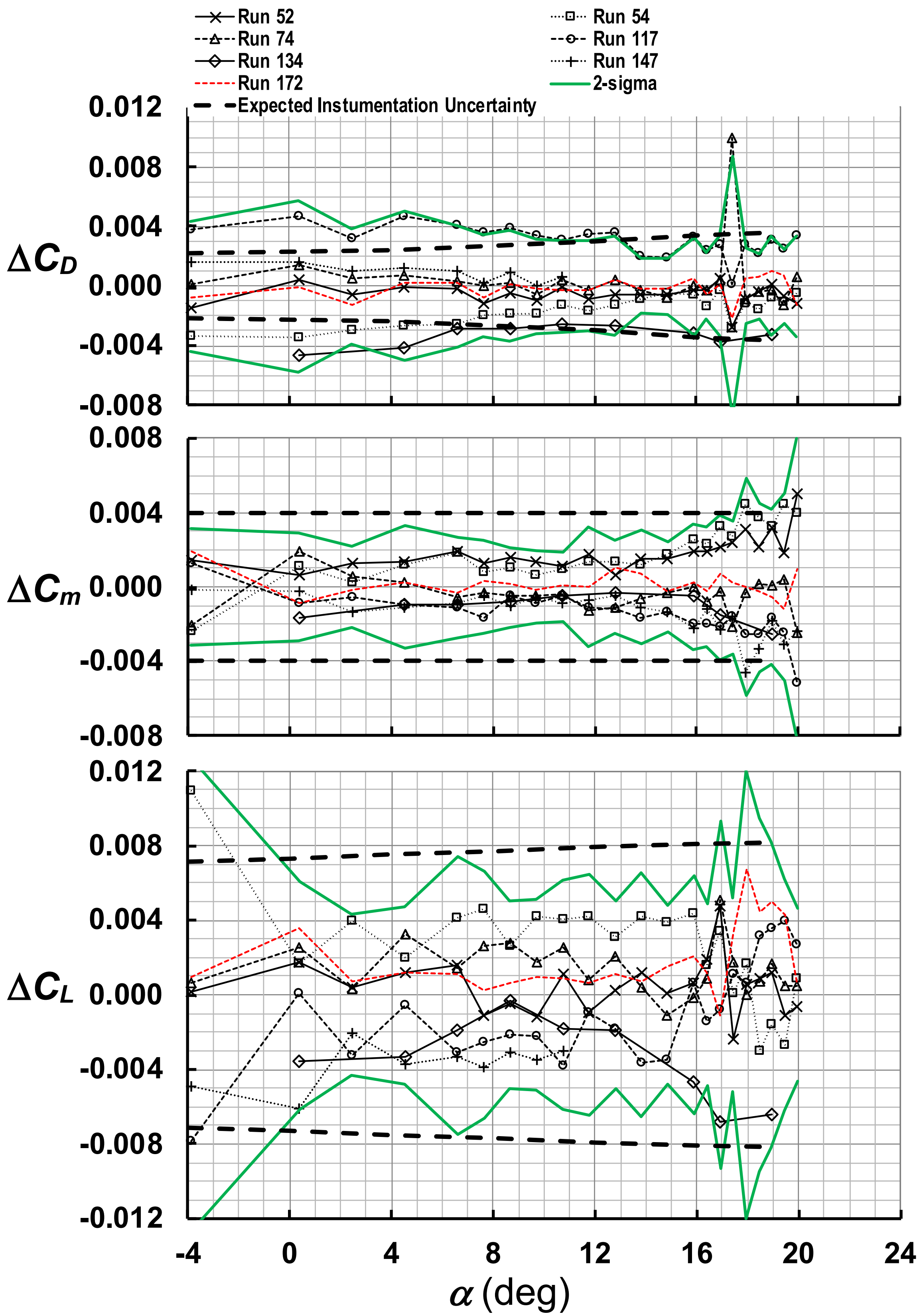


Figure 31. ΔC_D, ΔC_m and ΔC_L vs. α for repeat runs with AFC-off ($M_\infty = 0.2$, with TWICS).

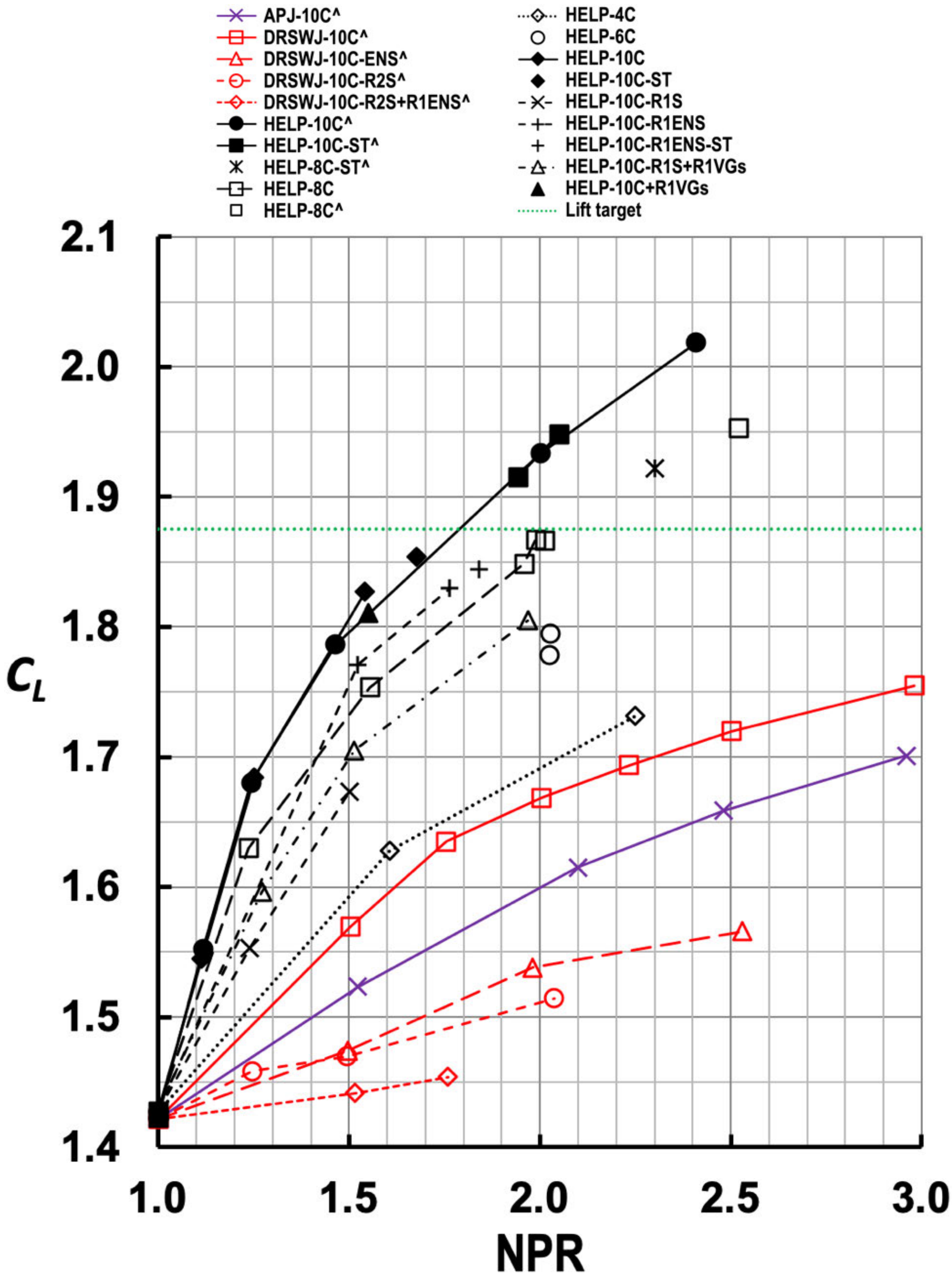


Figure 32. C_L vs. NPR for various AFC actuator configurations ($\alpha = 8.9°$, $M_\infty = 0.2$).

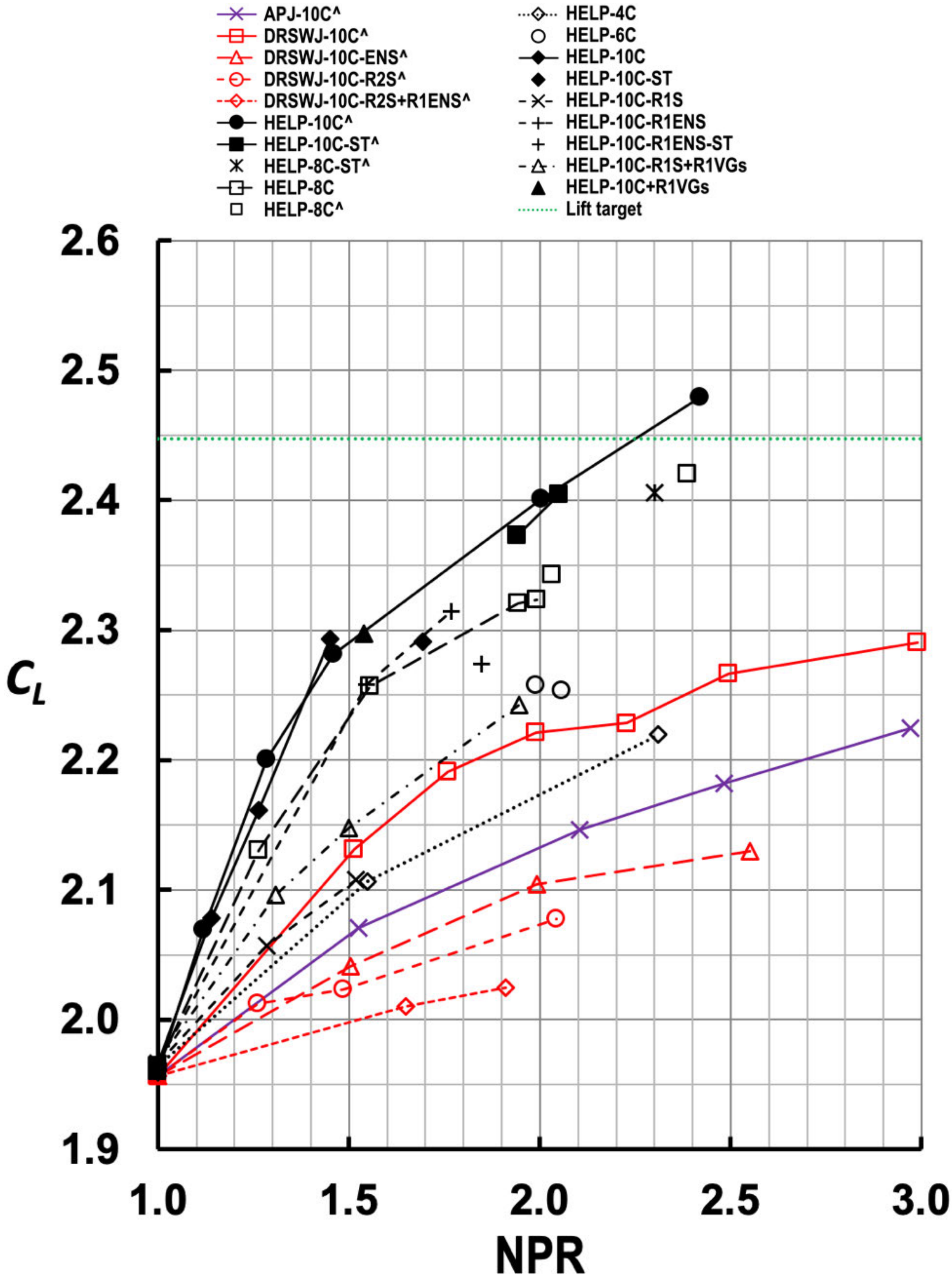


Figure 33. C_L vs. NPR for various AFC actuator configurations ($\alpha = 17.1°$, $M_\infty = 0.2$).

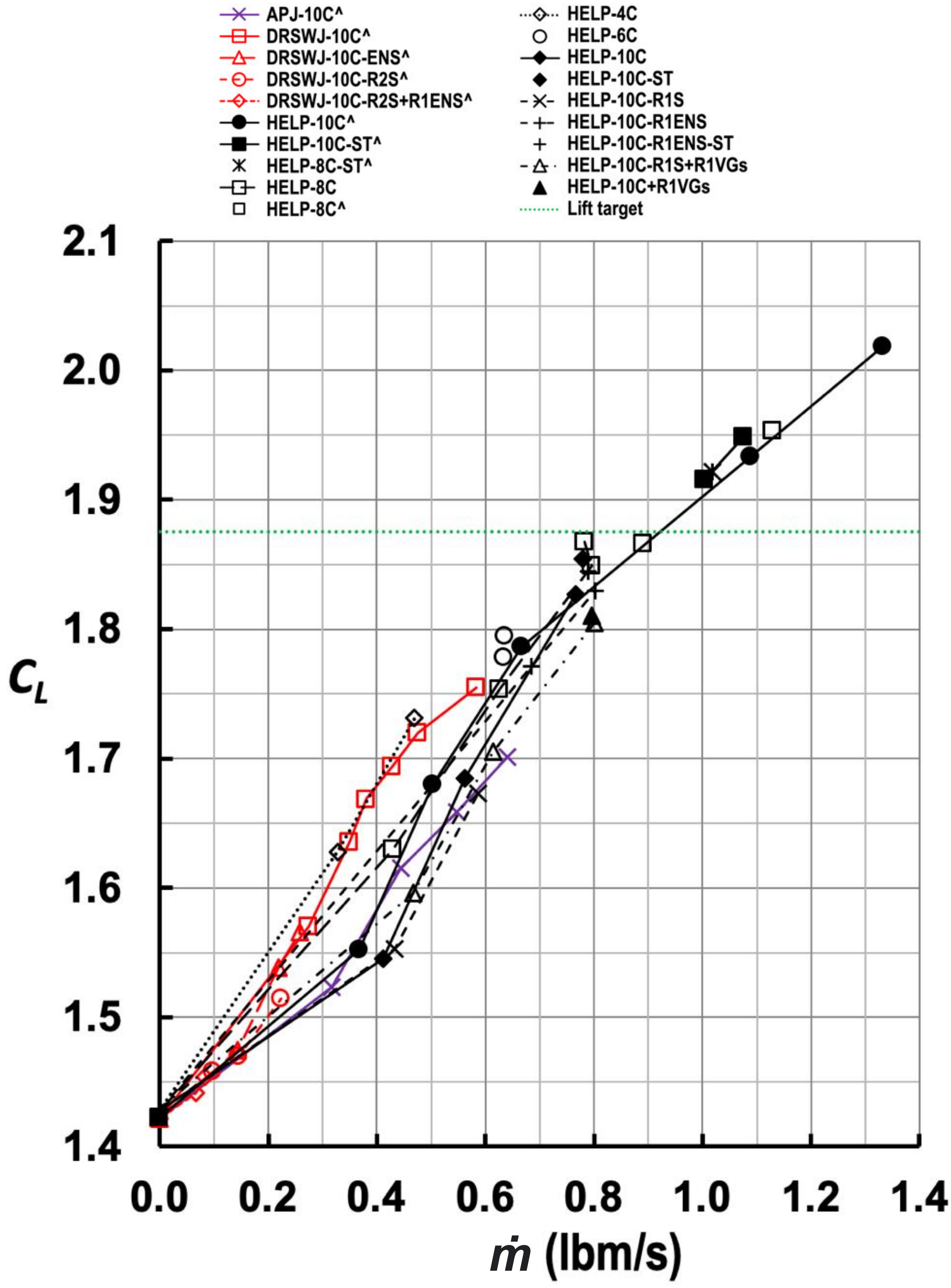


Figure 34. C_L vs. $\dot{m}$ for various AFC actuator configurations ($\alpha = 8.9°$, $M_\infty = 0.2$).

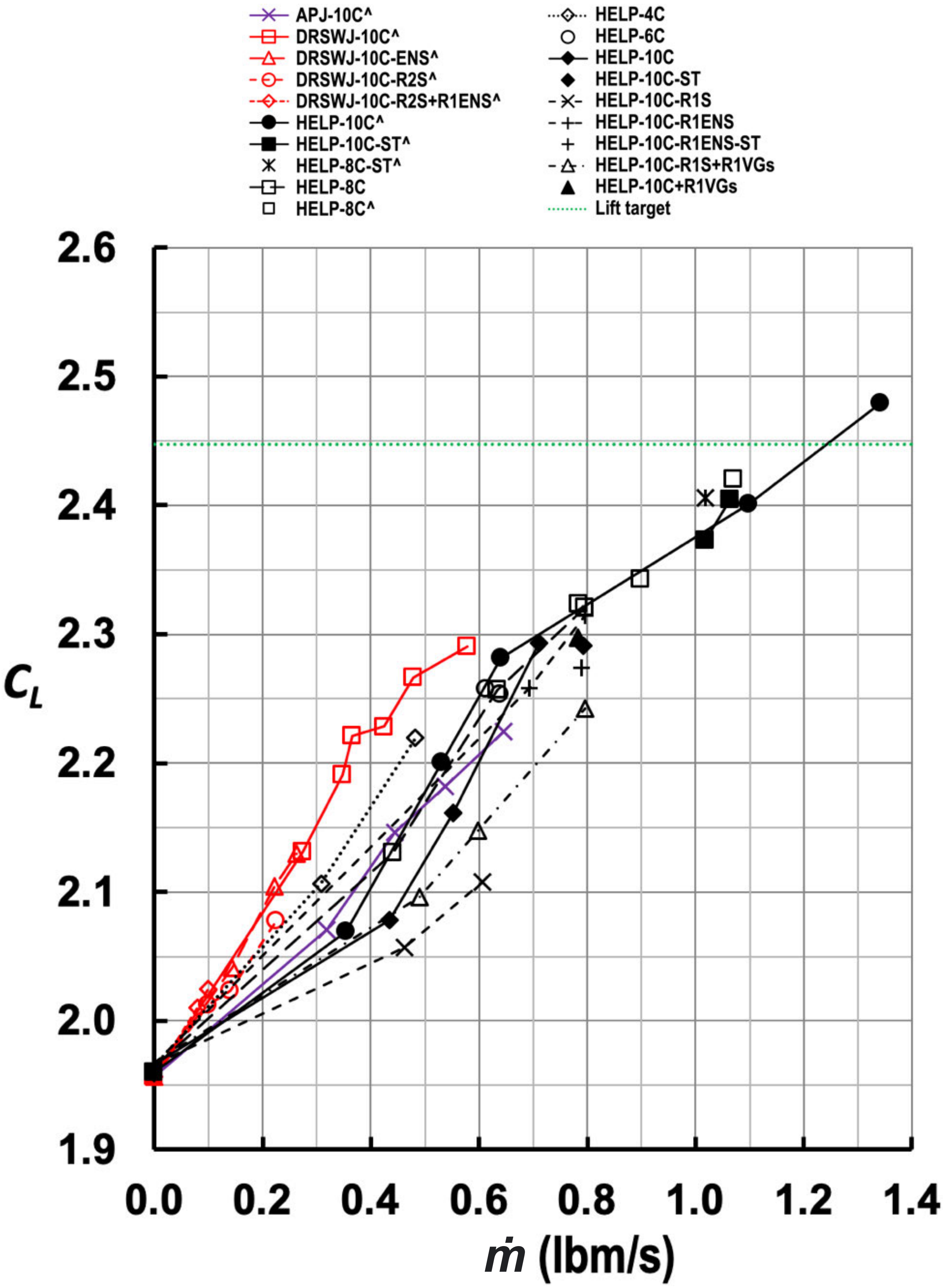


Figure 35. C_L vs. $\dot{m}$ for various AFC actuator configurations ($\alpha = 17.1°$, $M_\infty = 0.2$).

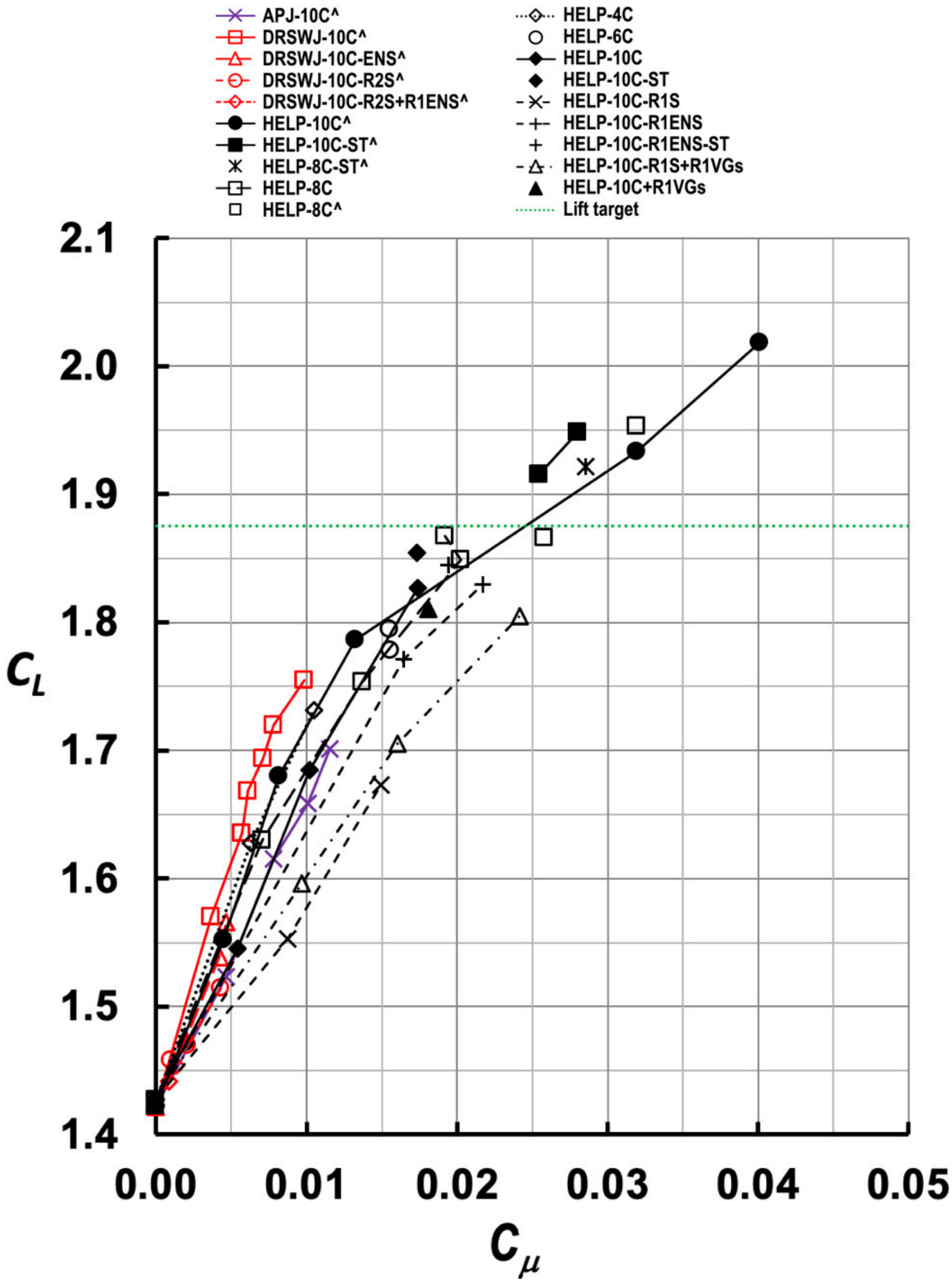


Figure 36. C_L vs. C_μ for various AFC actuator configurations ($\alpha = 8.9°$, $M_\infty = 0.2$).

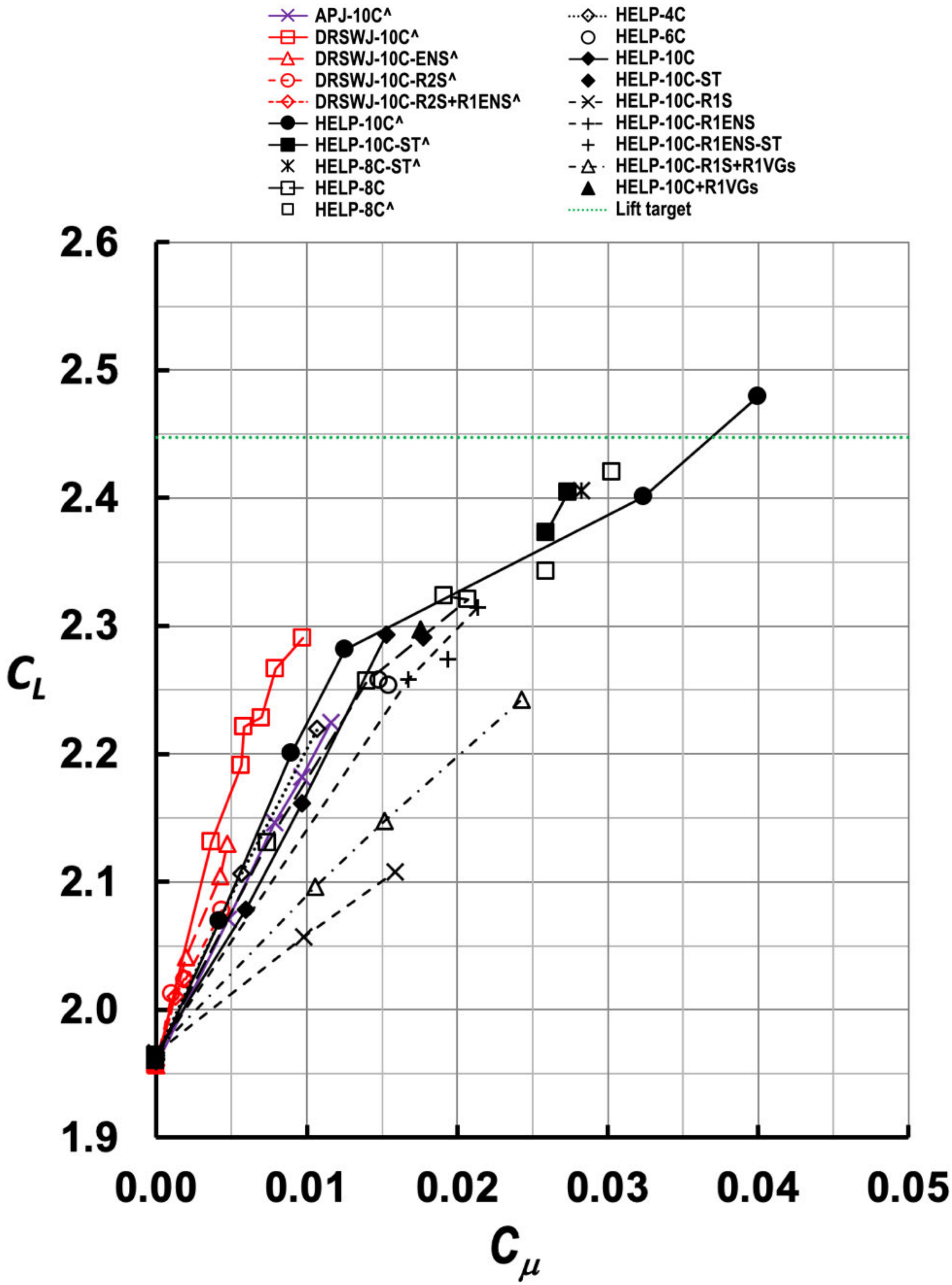


Figure 37. C_L vs. C_μ for various AFC actuator configurations ($\alpha = 17.1°$, $M_\infty = 0.2$).

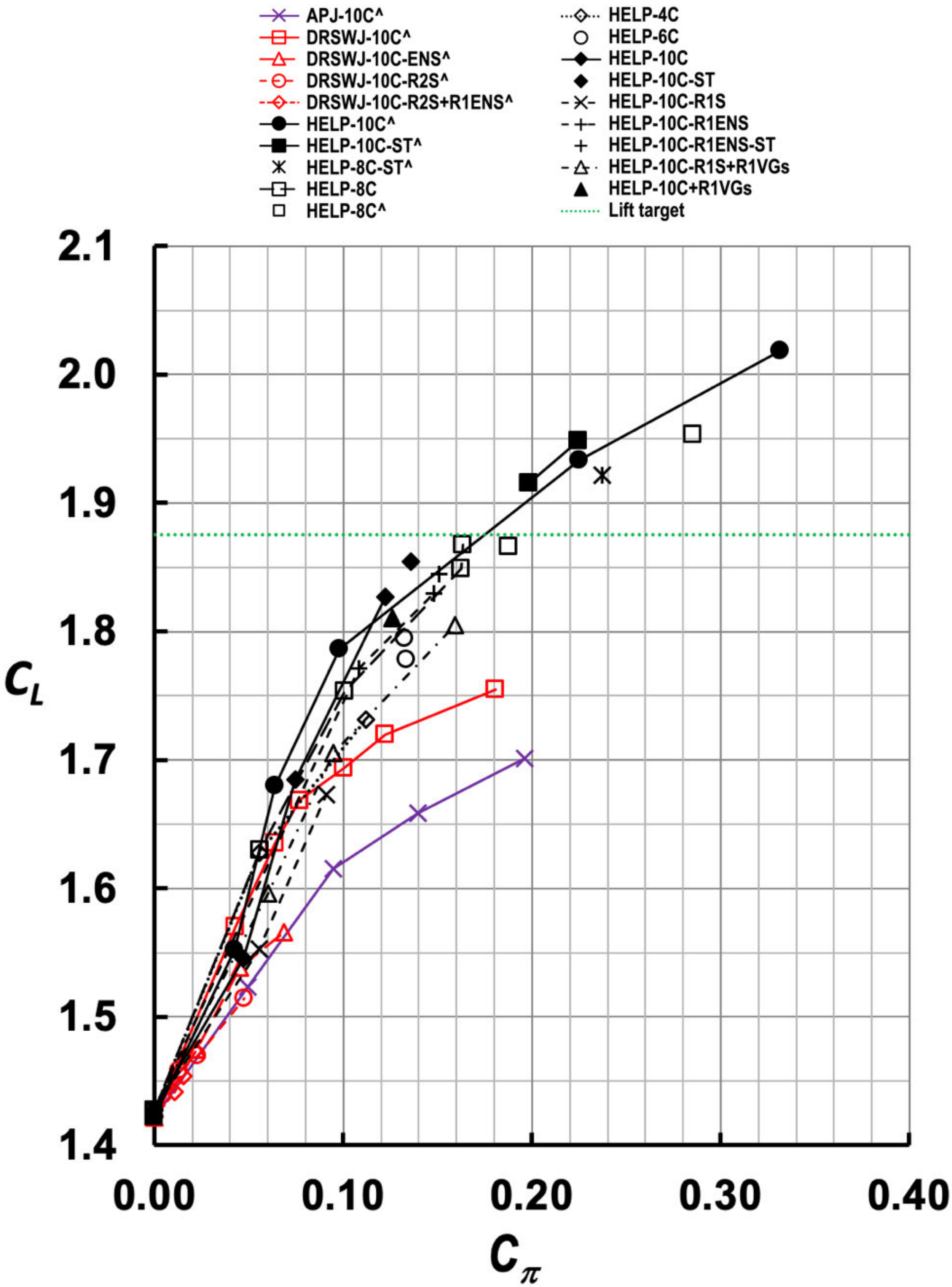


Figure 38. C_L vs. C_π for various AFC actuator configurations ($\alpha = 8.9°$, $M_\infty = 0.2$).

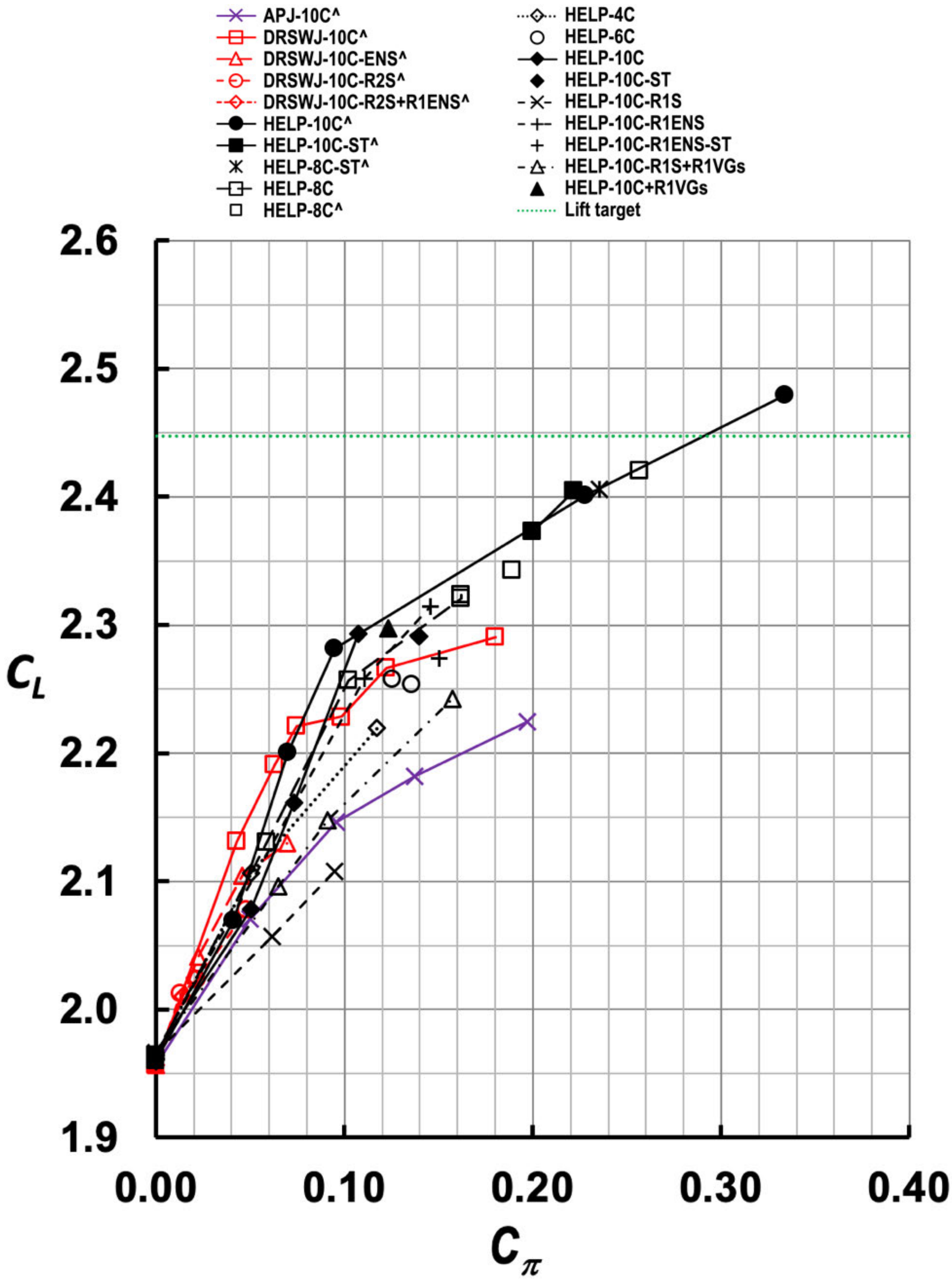


Figure 39. C_L vs. C_π for various AFC actuator configurations ($\alpha = 17.1°$, $M_\infty = 0.2$).

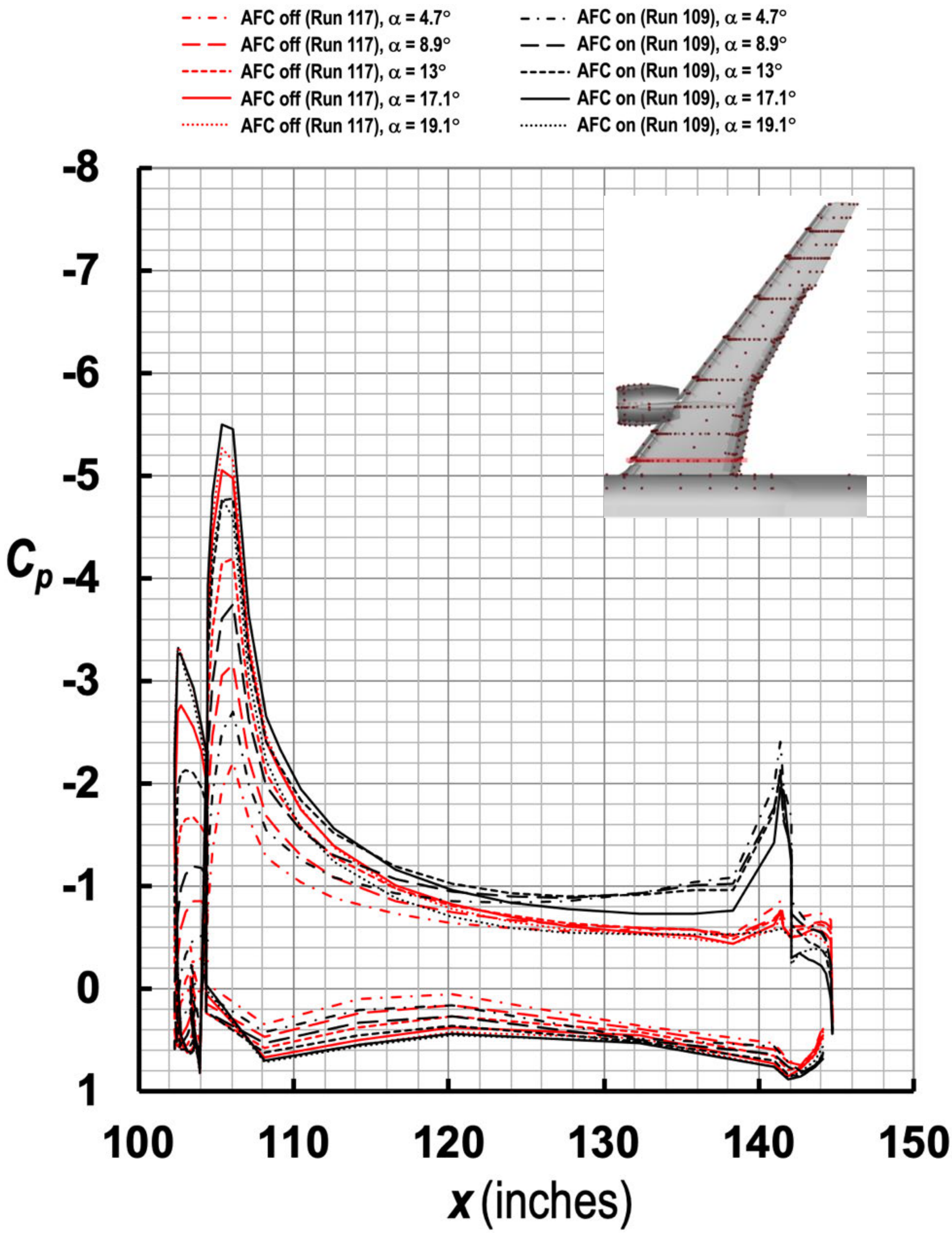


Figure 40. Streamwise C_p distributions at $\eta = 0.15$ for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack ($M_\infty = 0.2$, with TWICS).

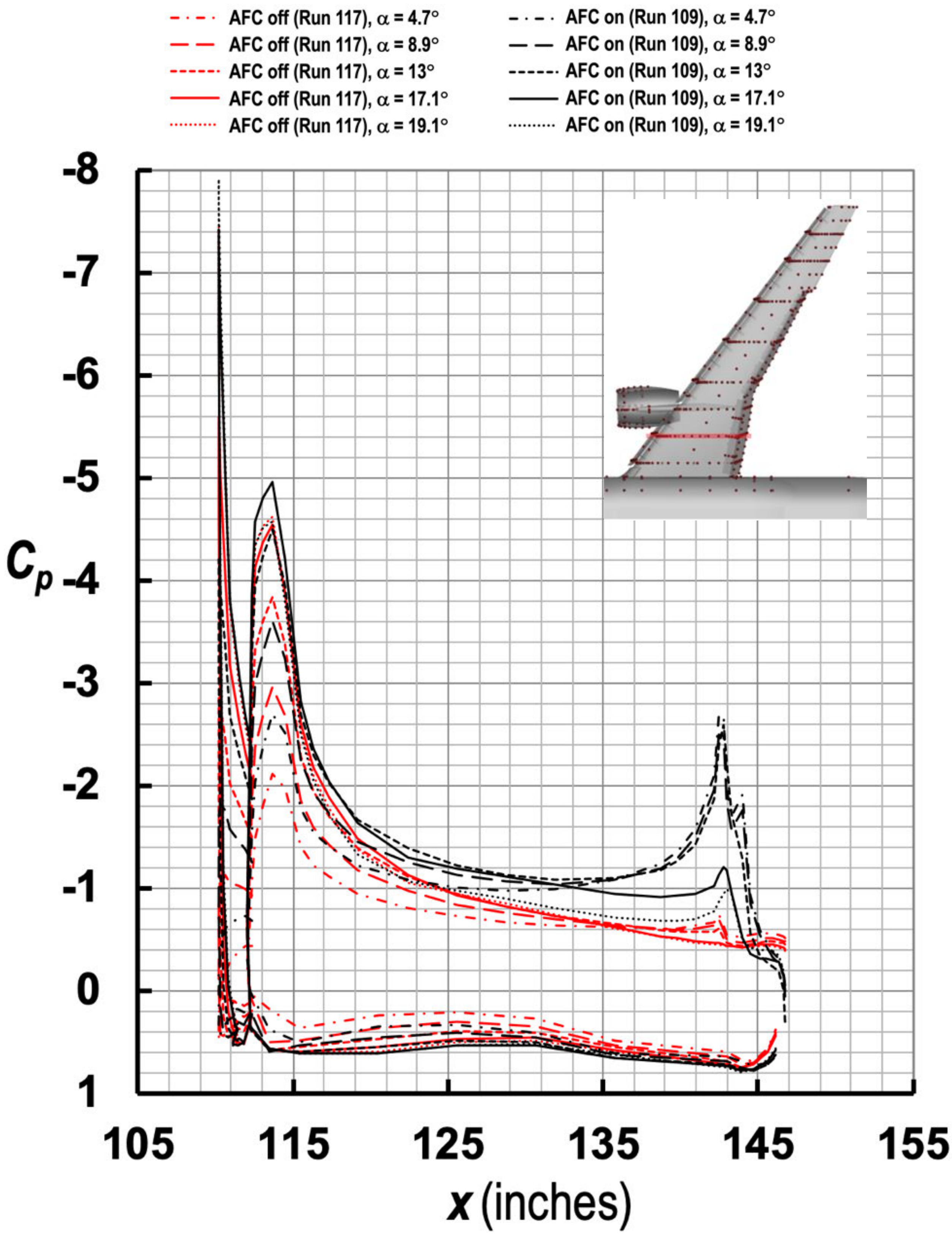


Figure 41. Streamwise C_p distributions at $\eta = 0.24$ for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack ($M_\infty = 0.2$, with TWICS).

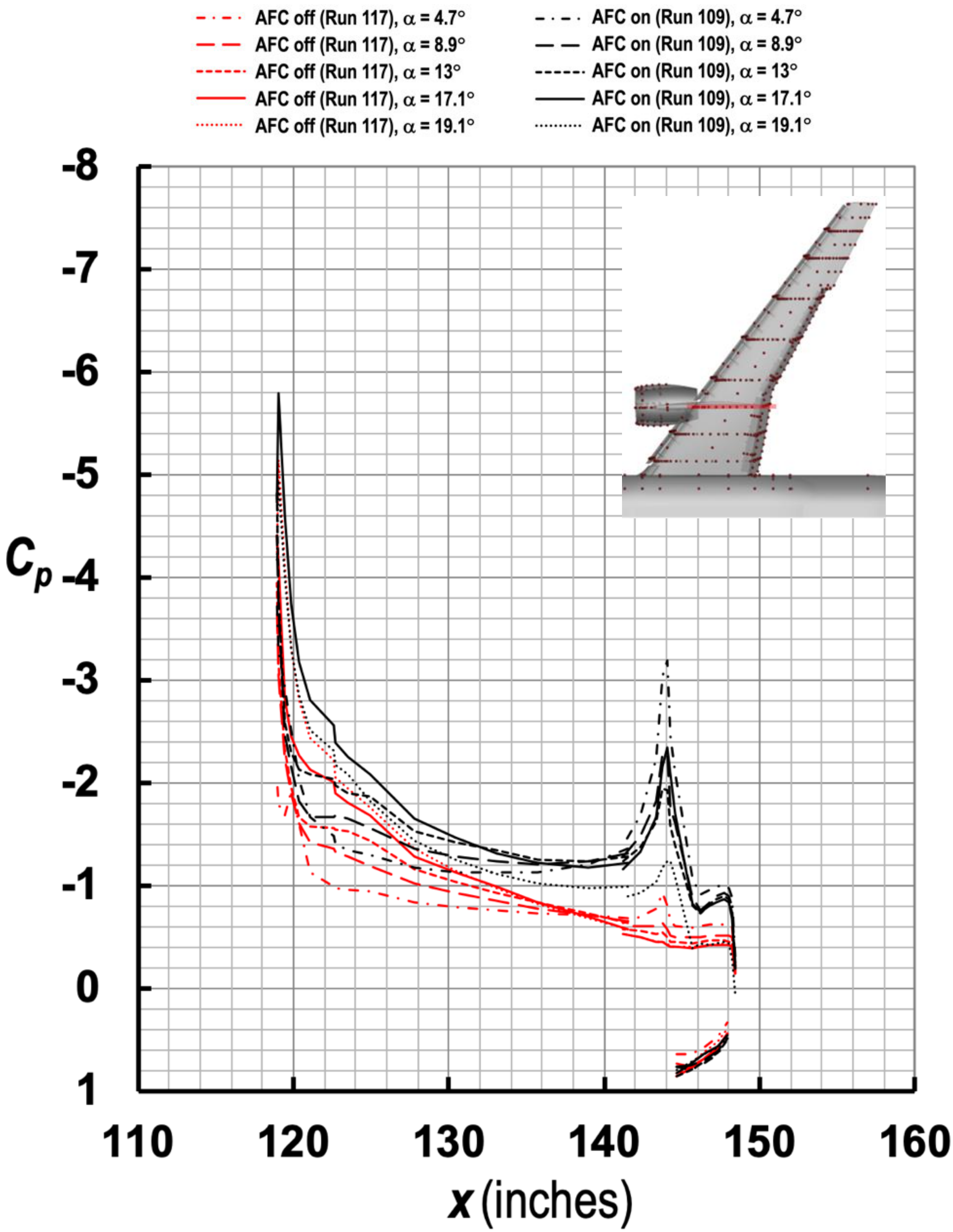


Figure 42. Streamwise C_p distributions at $\eta = 0.33$ for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack ($M_\infty = 0.2$, with TWICS).

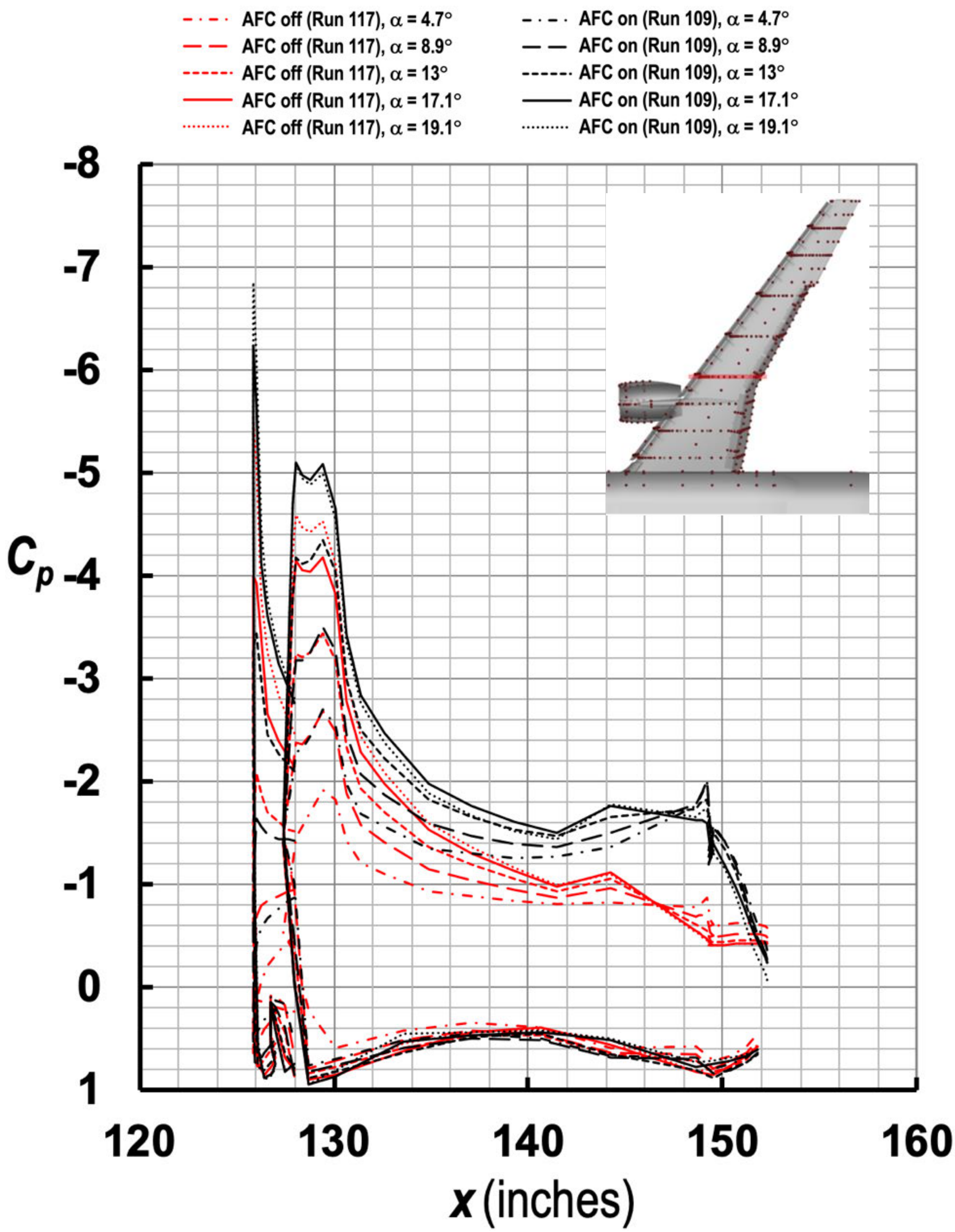


Figure 43. Streamwise C_p distributions at η = 0.42 for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack (M_∞ = 0.2, with TWICS).

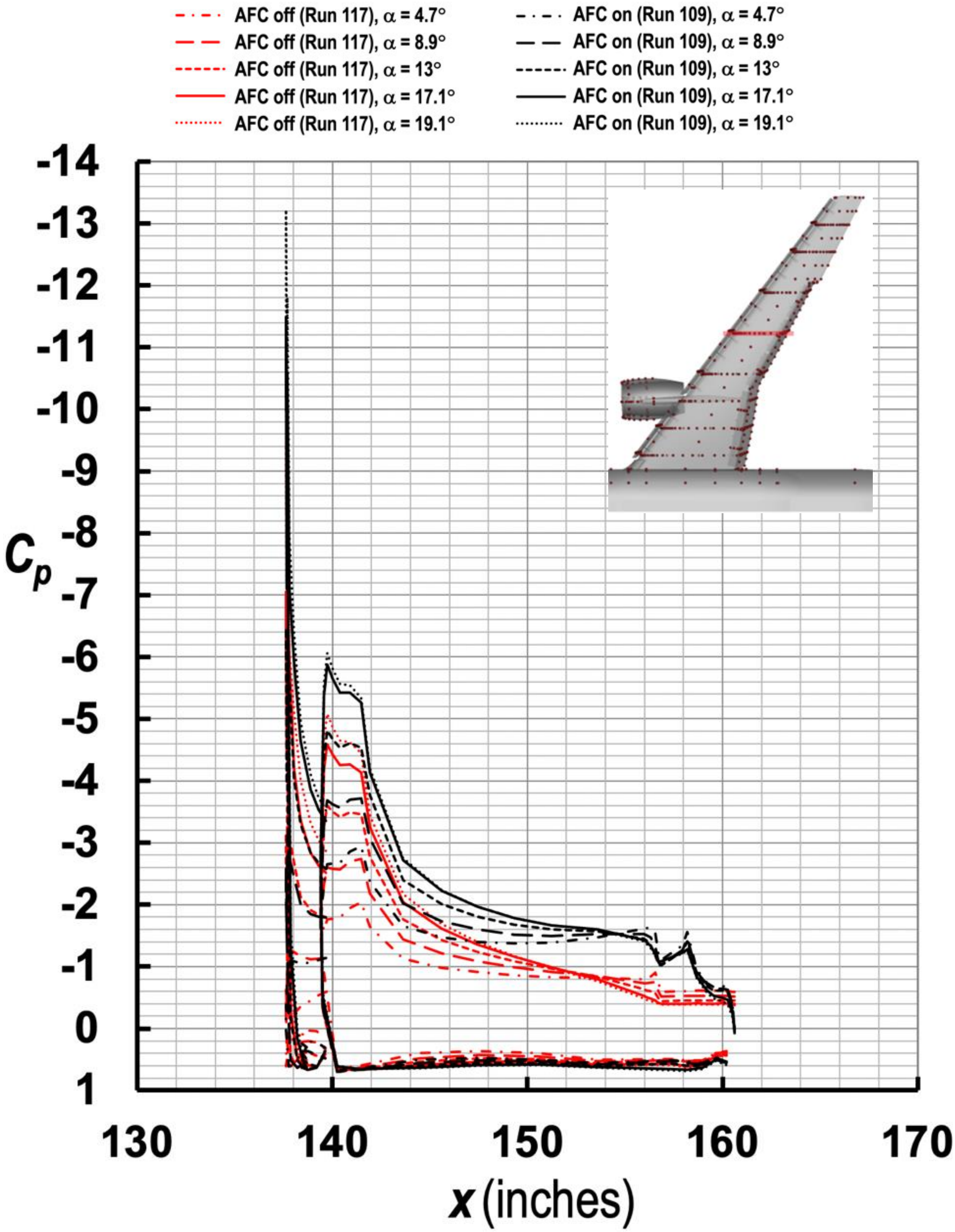


Figure 44. Streamwise C_p distributions at $\eta = 0.55$ for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack ($M_\infty = 0.2$, with TWICS).

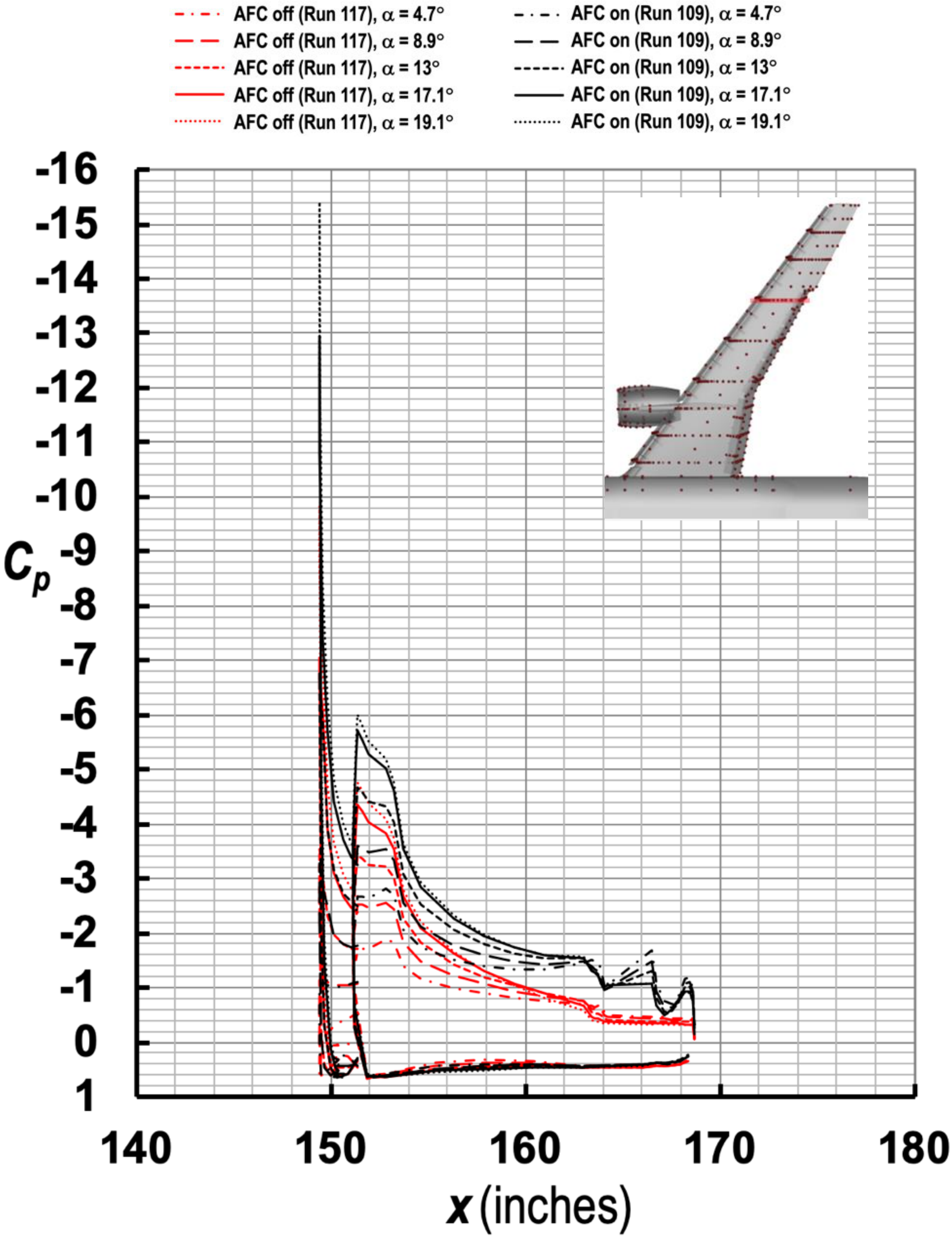


Figure 45. Streamwise C_p distributions at $\eta = 0.69$ for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack ($M_\infty = 0.2$, with TWICS).

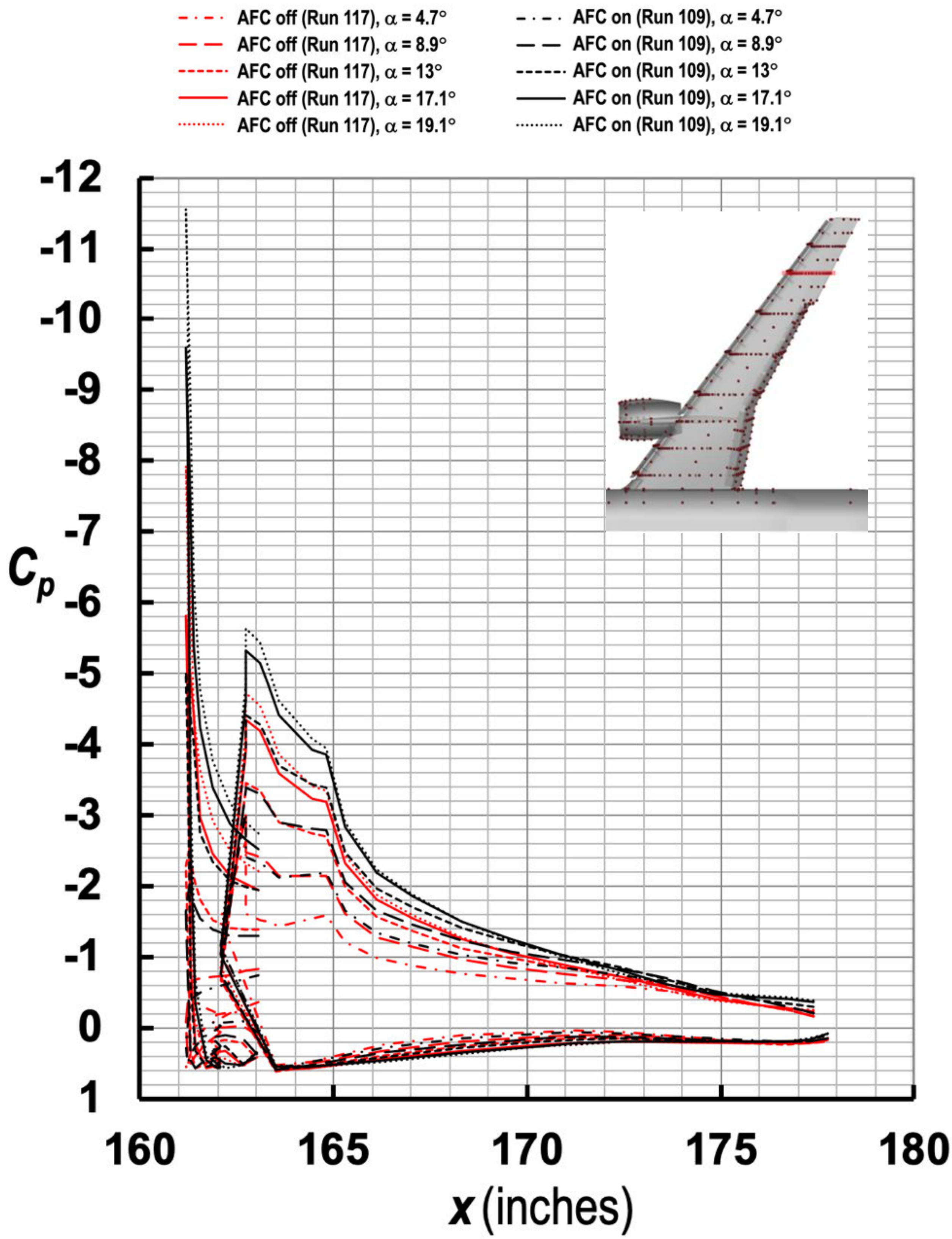


Figure 46. Streamwise C_p distributions at $\eta = 0.82$ for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack ($M_\infty = 0.2$, with TWICS).

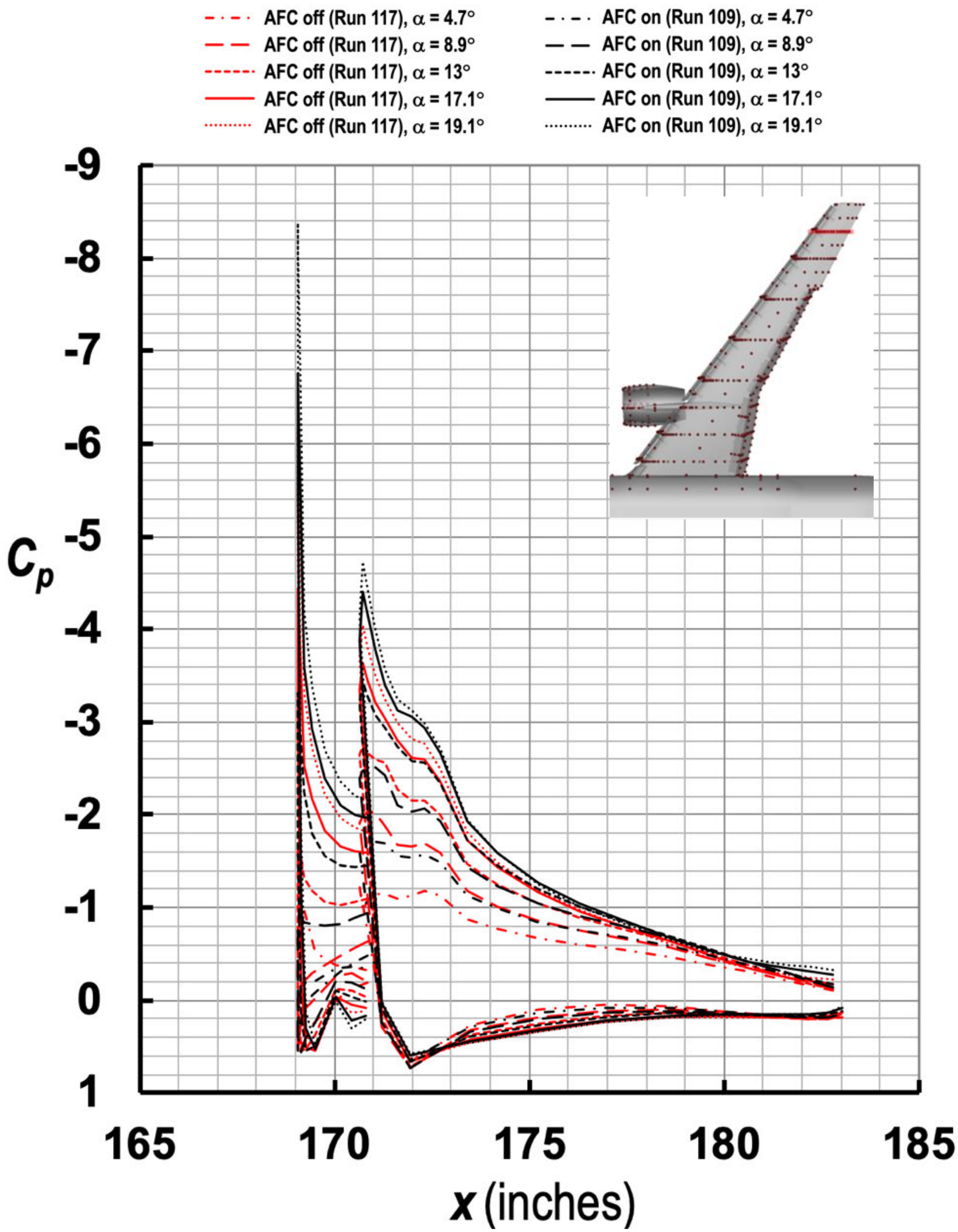


Figure 47. Streamwise C_p distributions at $\eta = 0.91$ for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack ($M_\infty = 0.2$, with TWICS).

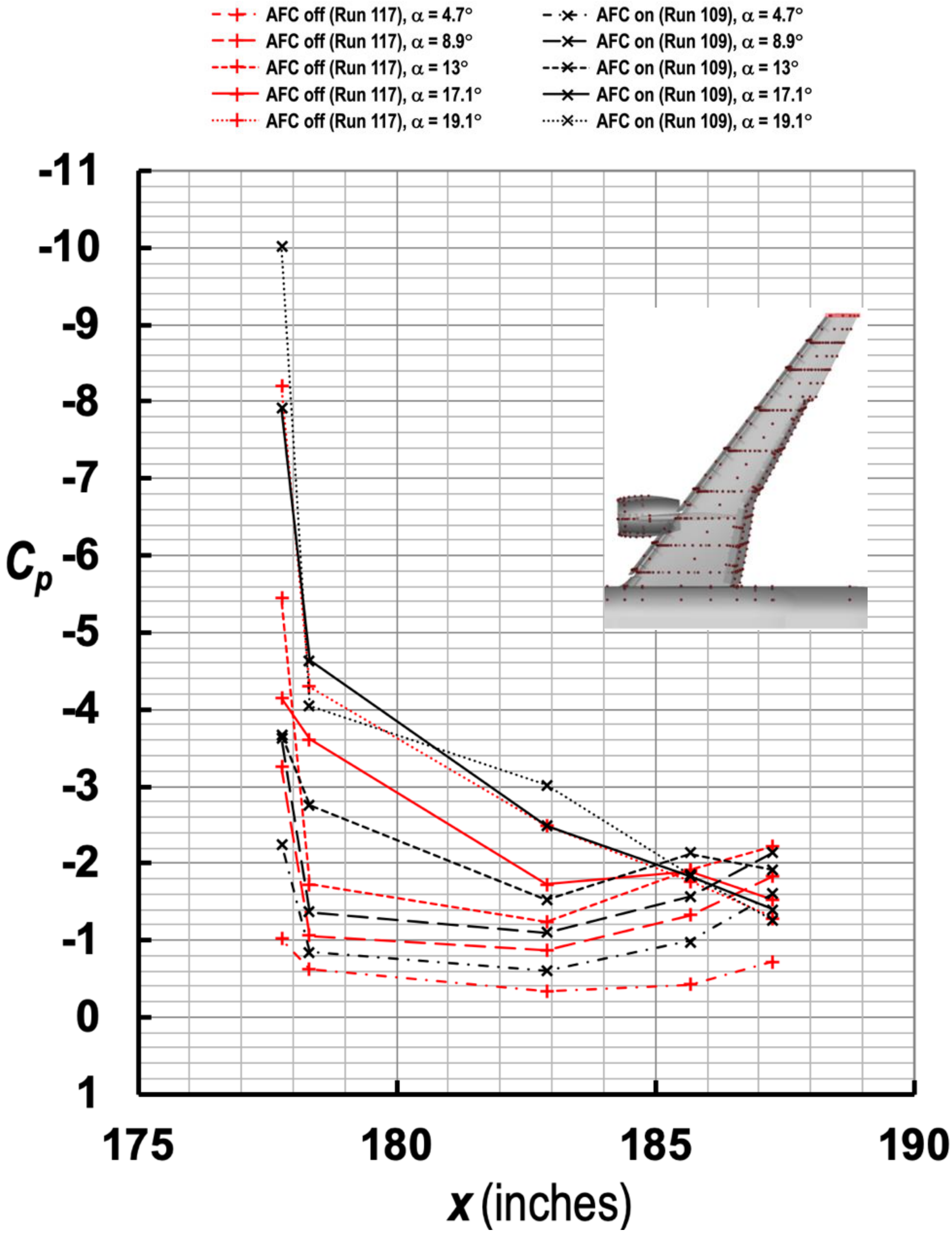


Figure 48. Streamwise C_p distributions at $\eta = 1.0$ (wingtip) for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack ($M_\infty = 0.2$, with TWICS).

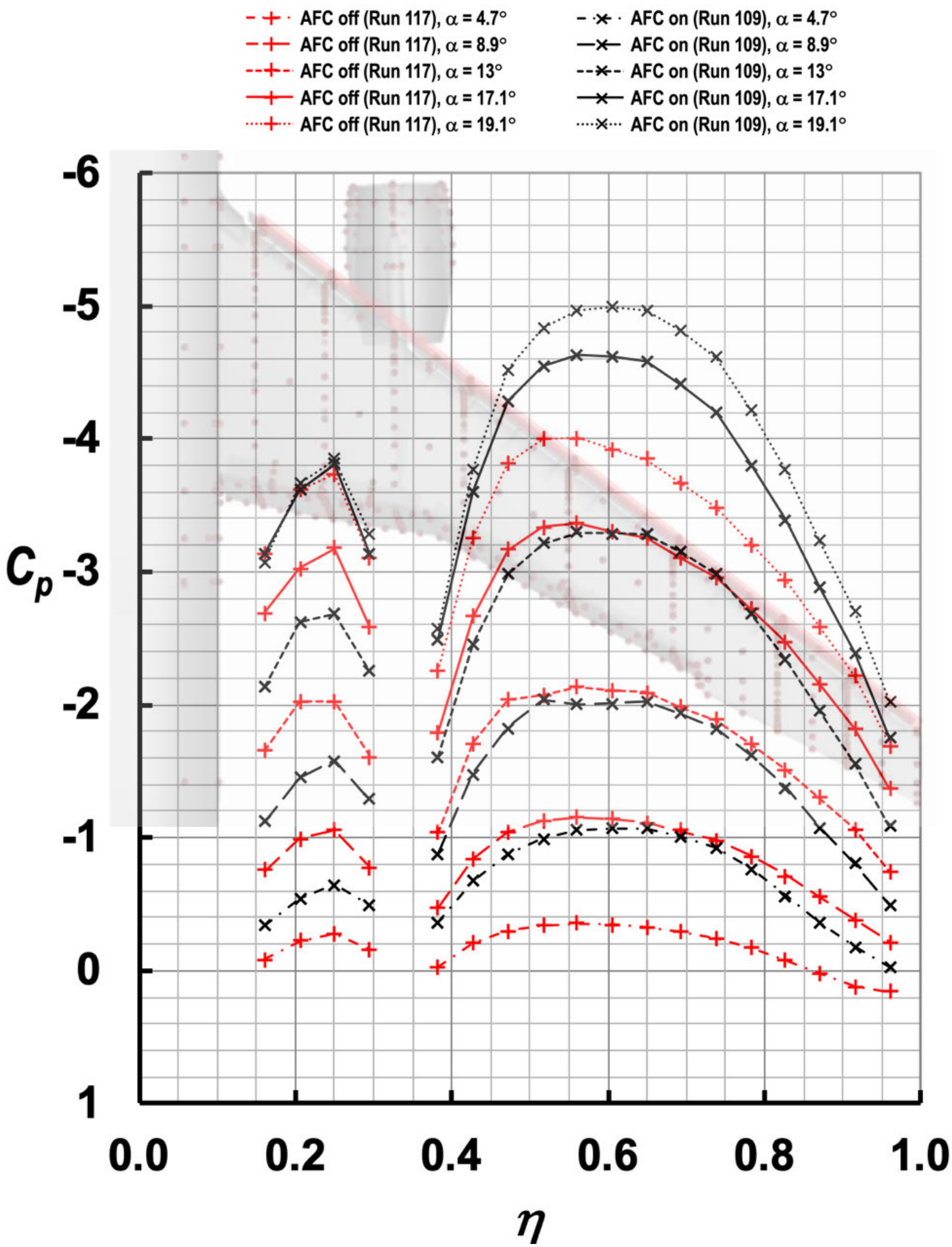


Figure 49. Spanwise C_p distributions along the mid-slat for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack ($M_\infty = 0.2$, with TWICS).

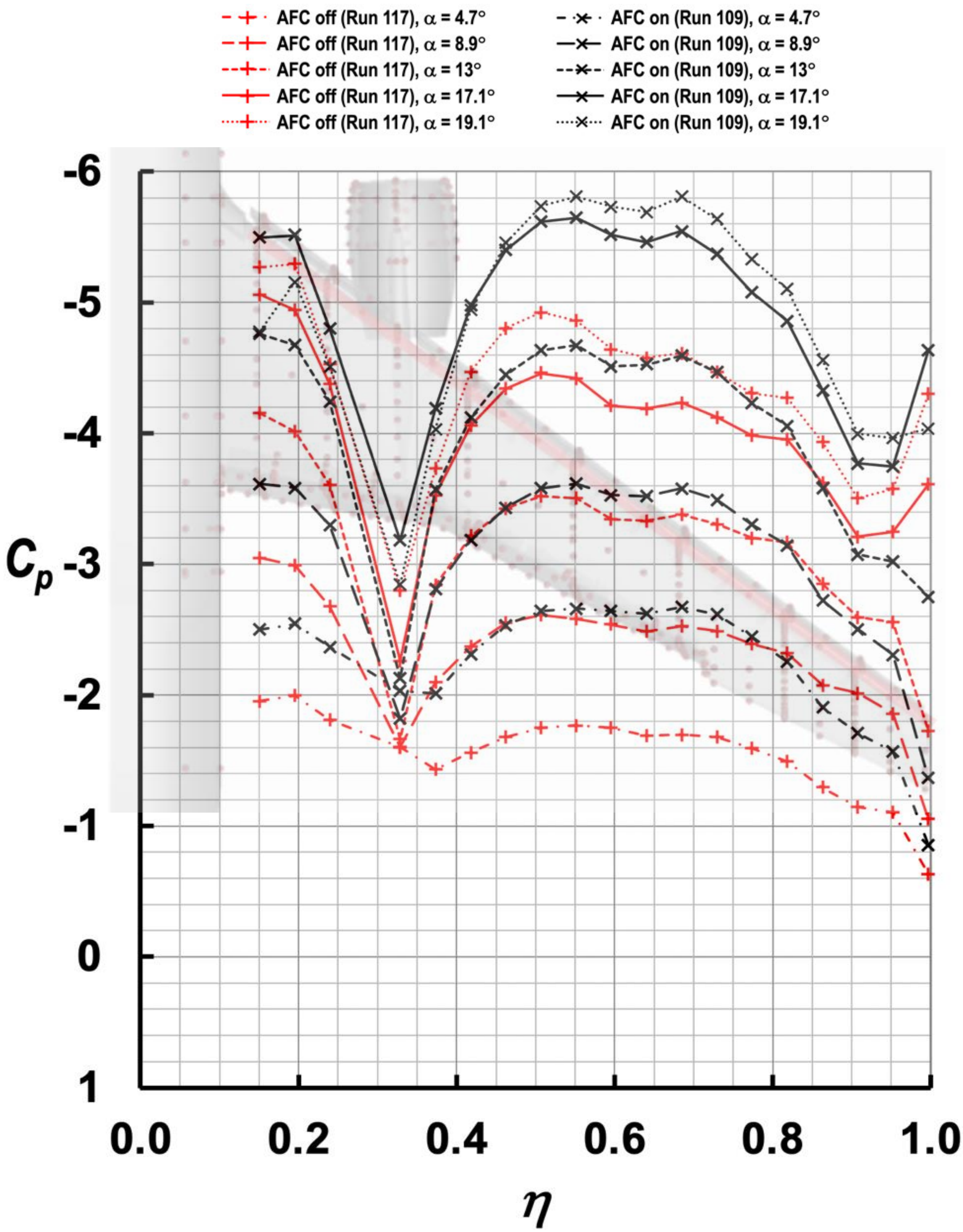


Figure 50. Spanwise C_p distributions along the wing leading edge for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack ($M_\infty = 0.2$, with TWICS).

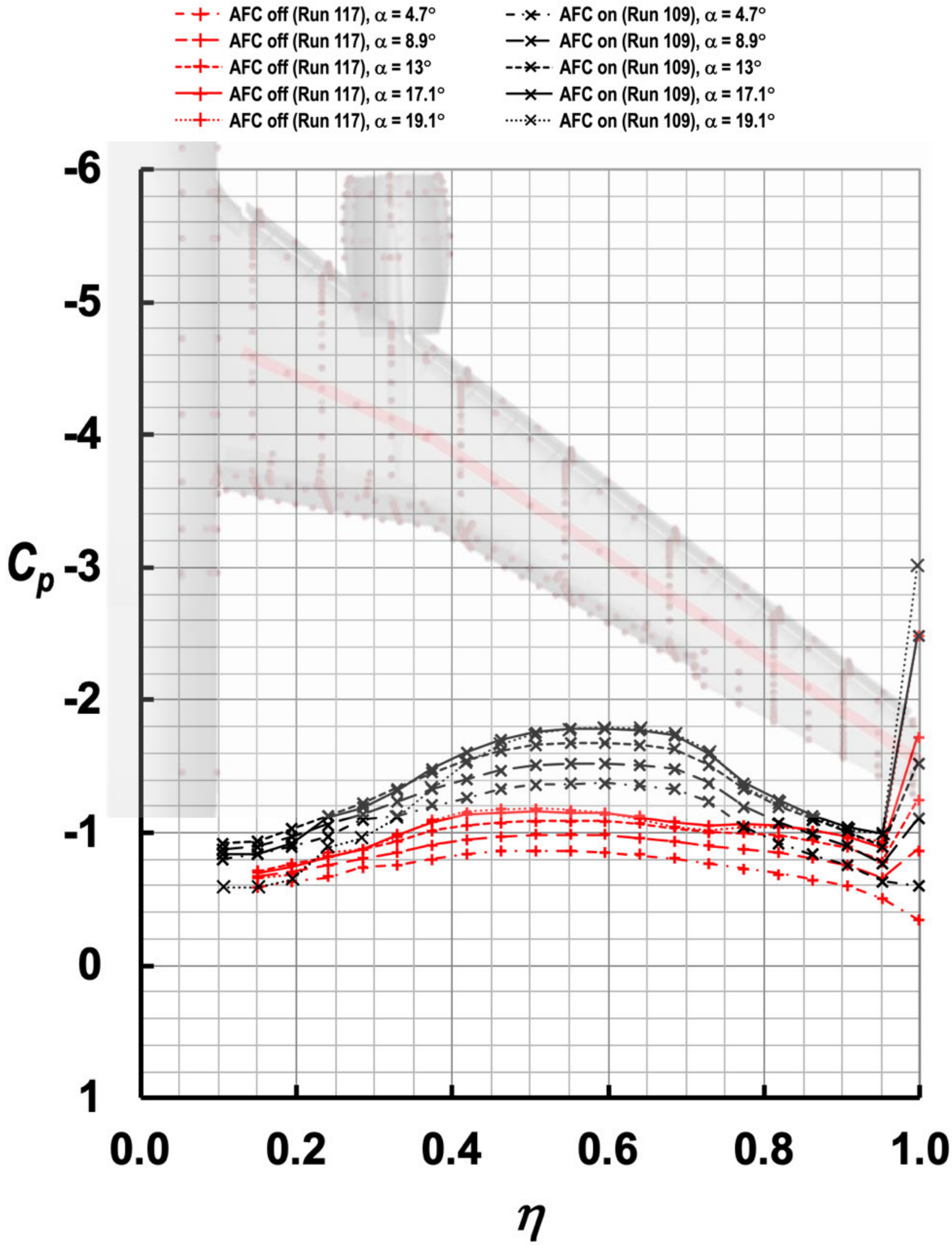


Figure 51. Spanwise C_p distributions along the mid-wing for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack ($M_\infty = 0.2$, with TWICS).

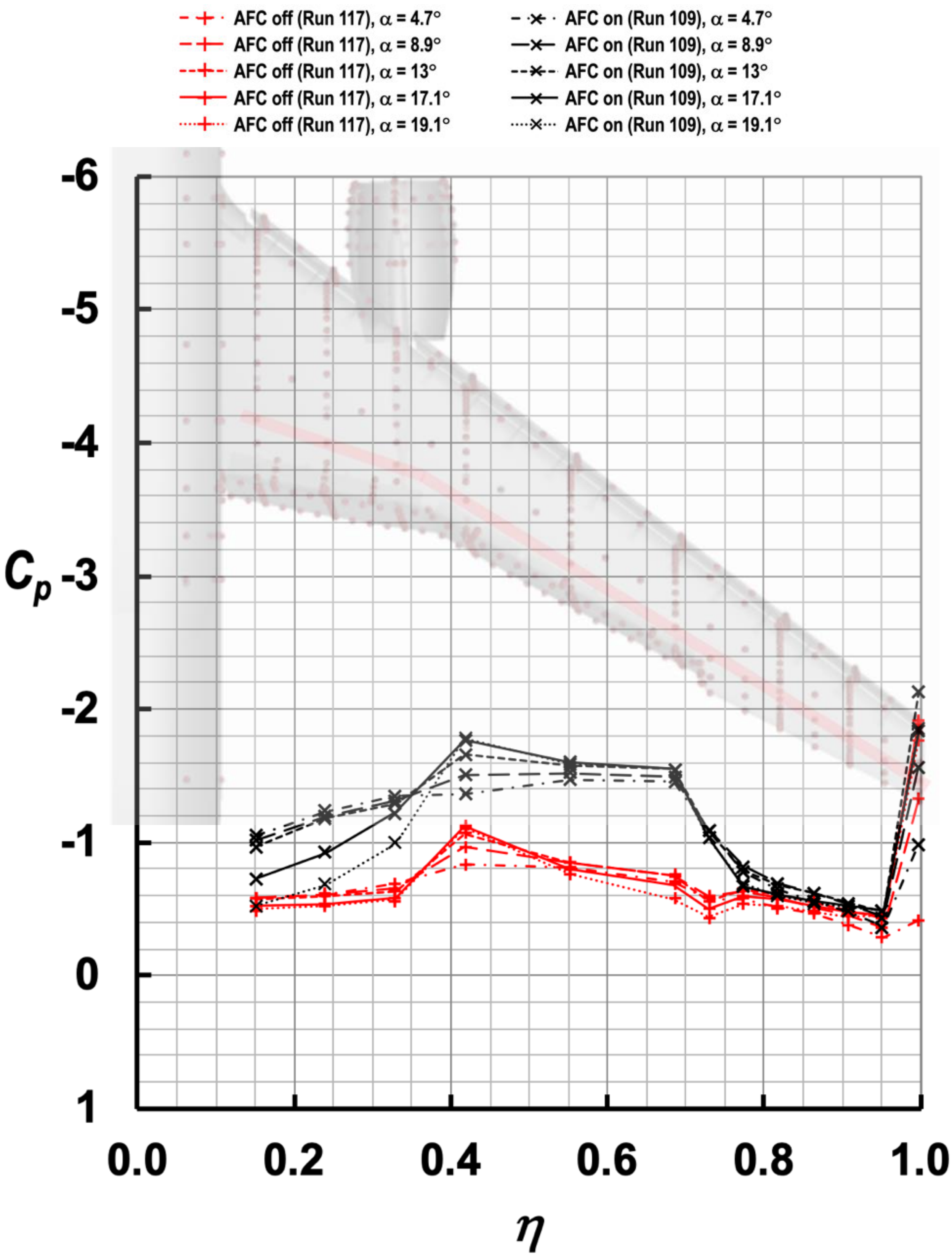


Figure 52. Spanwise C_p distributions just upstream of flap shoulder for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack ($M_\infty = 0.2$, with TWICS).

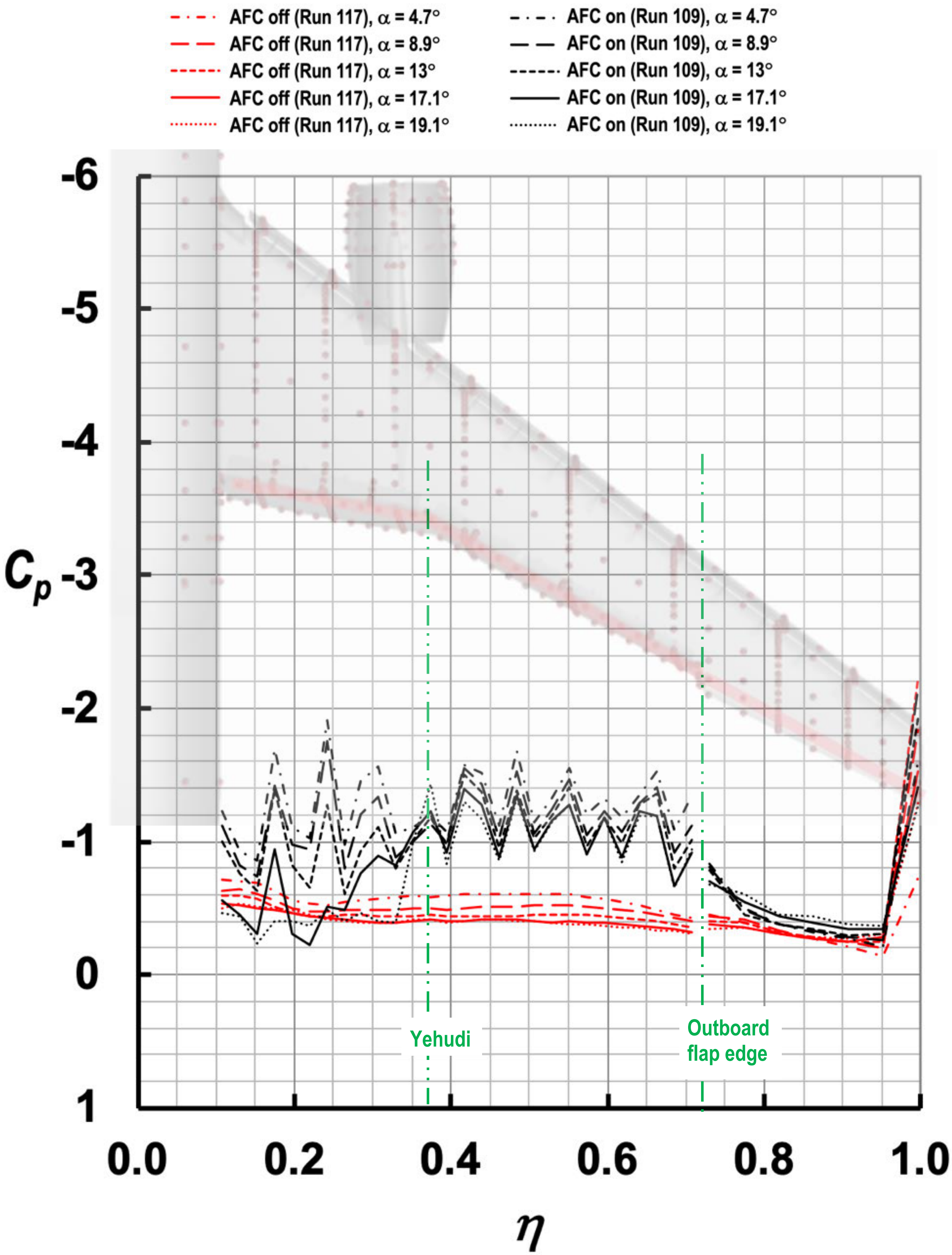


Figure 53. Spanwise C_p distributions just downstream of actuator location for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack ($M_\infty = 0.2$, with TWICS).

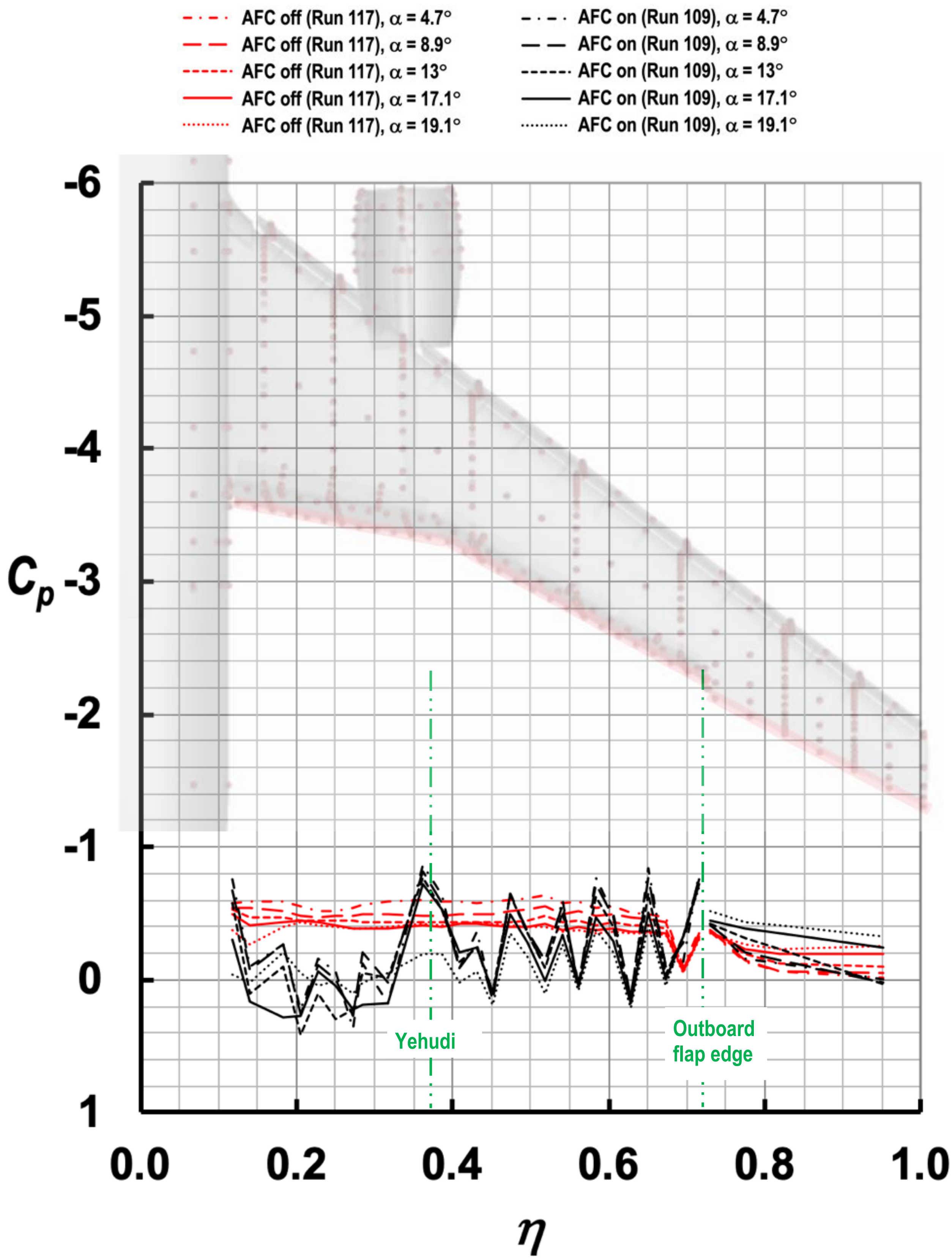


Figure 54. Spanwise C_p distributions along the flap and wing trailing edges for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack ($M_\infty = 0.2$, with TWICS).

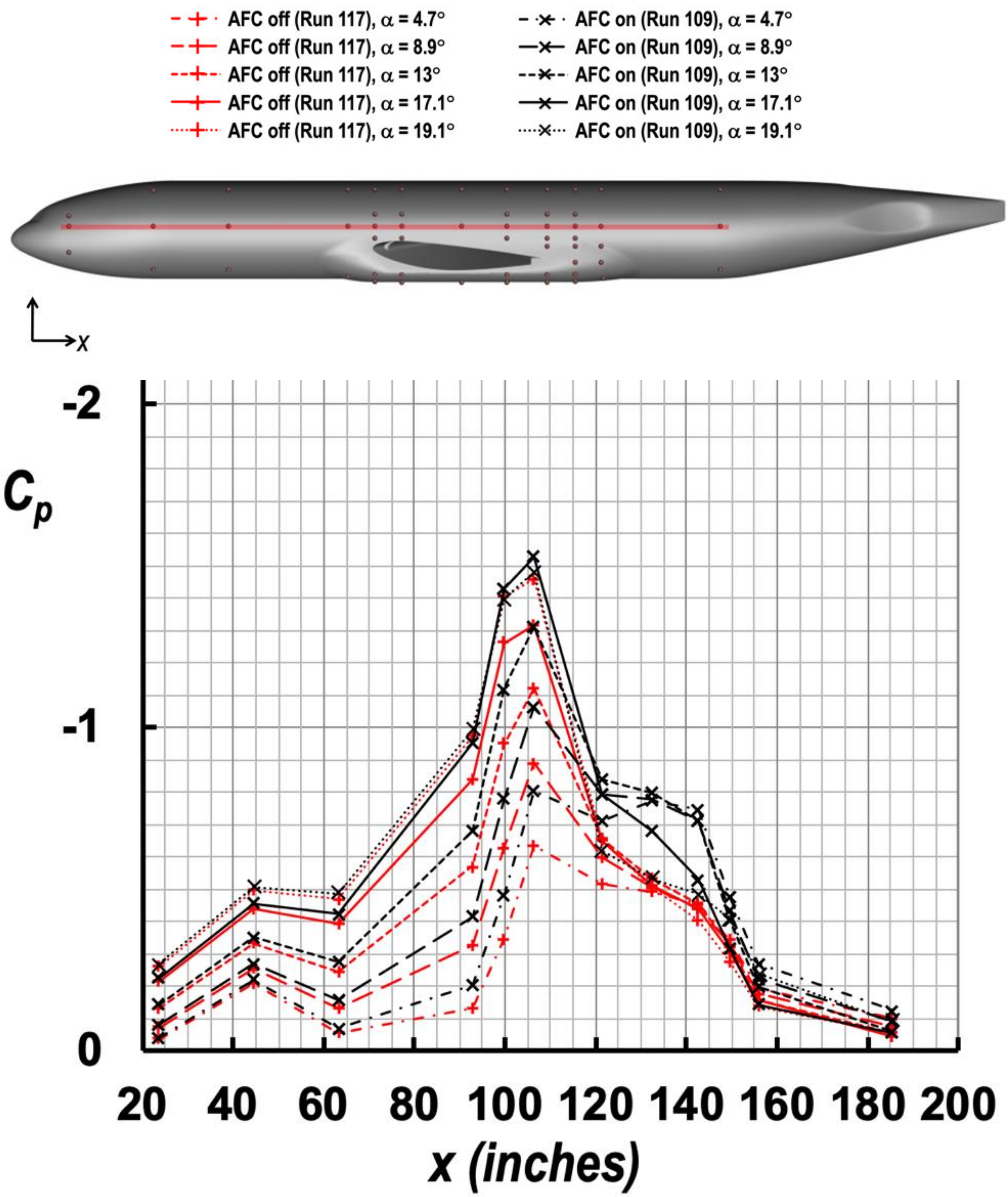


Figure 55. Streamwise C_p distributions at z = 23 inches on the fuselage for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack (M_∞ = 0.2, with TWICS).

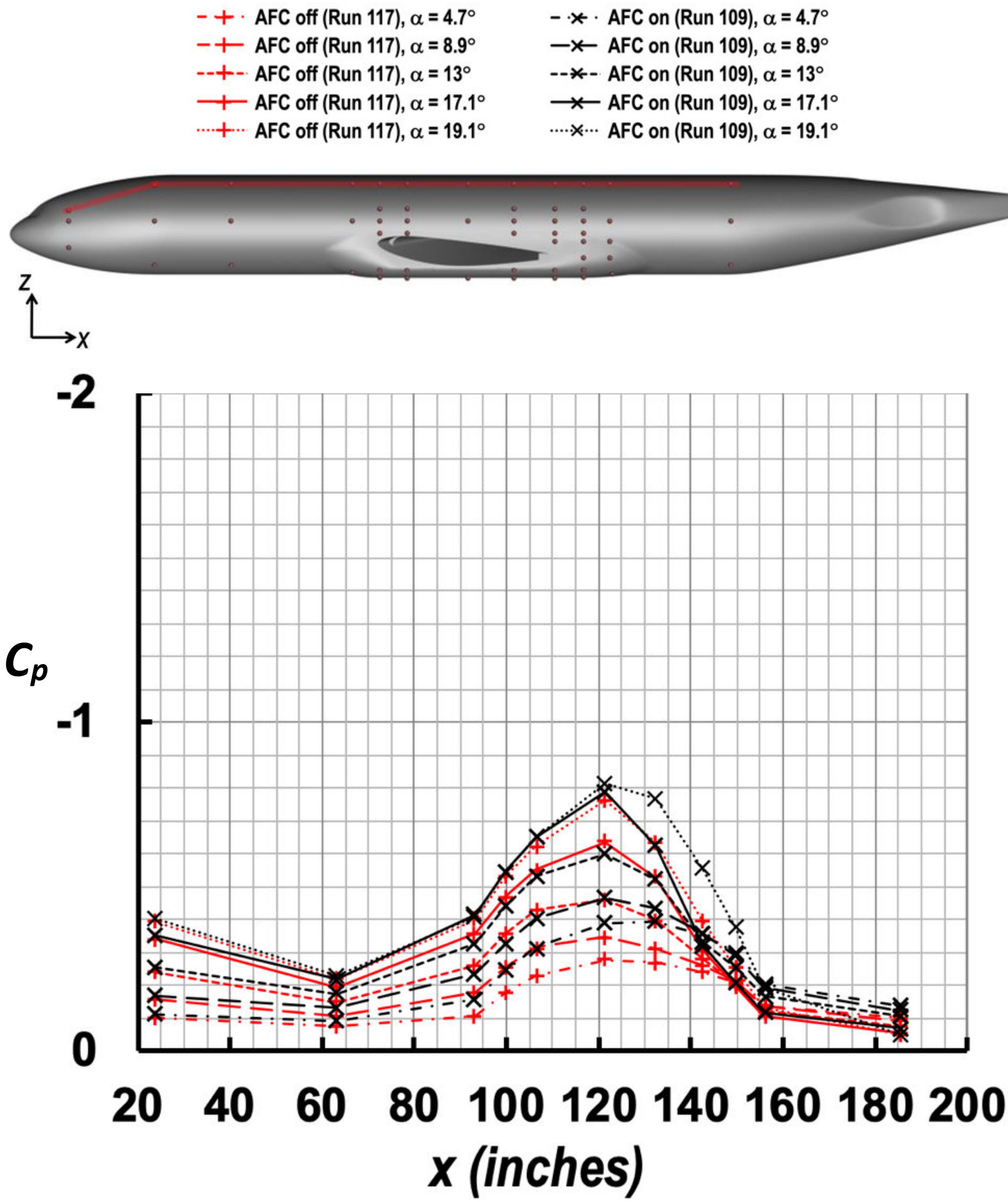


Figure 56. Streamwise C_p distributions at z = 32 inches (x > 23.6 inch station) on the fuselage for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack ($M_\infty = 0.2$, with TWICS).

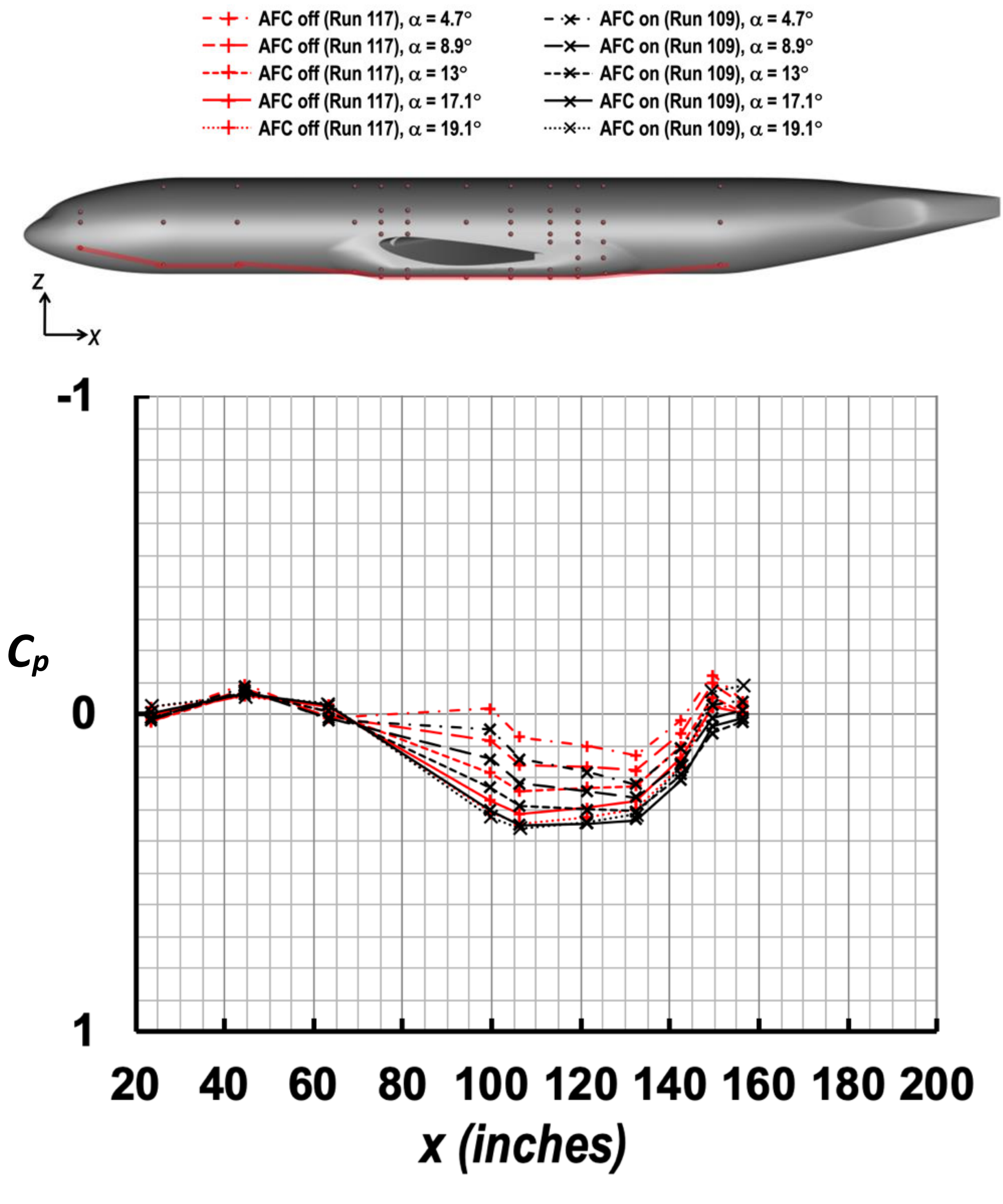


Figure 57. Streamwise C_p distributions at $z \sim 9$ inches ($106.4 \leq x \leq 142.6$) on the fuselage for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack ($M_\infty = 0.2$, with TWICS).

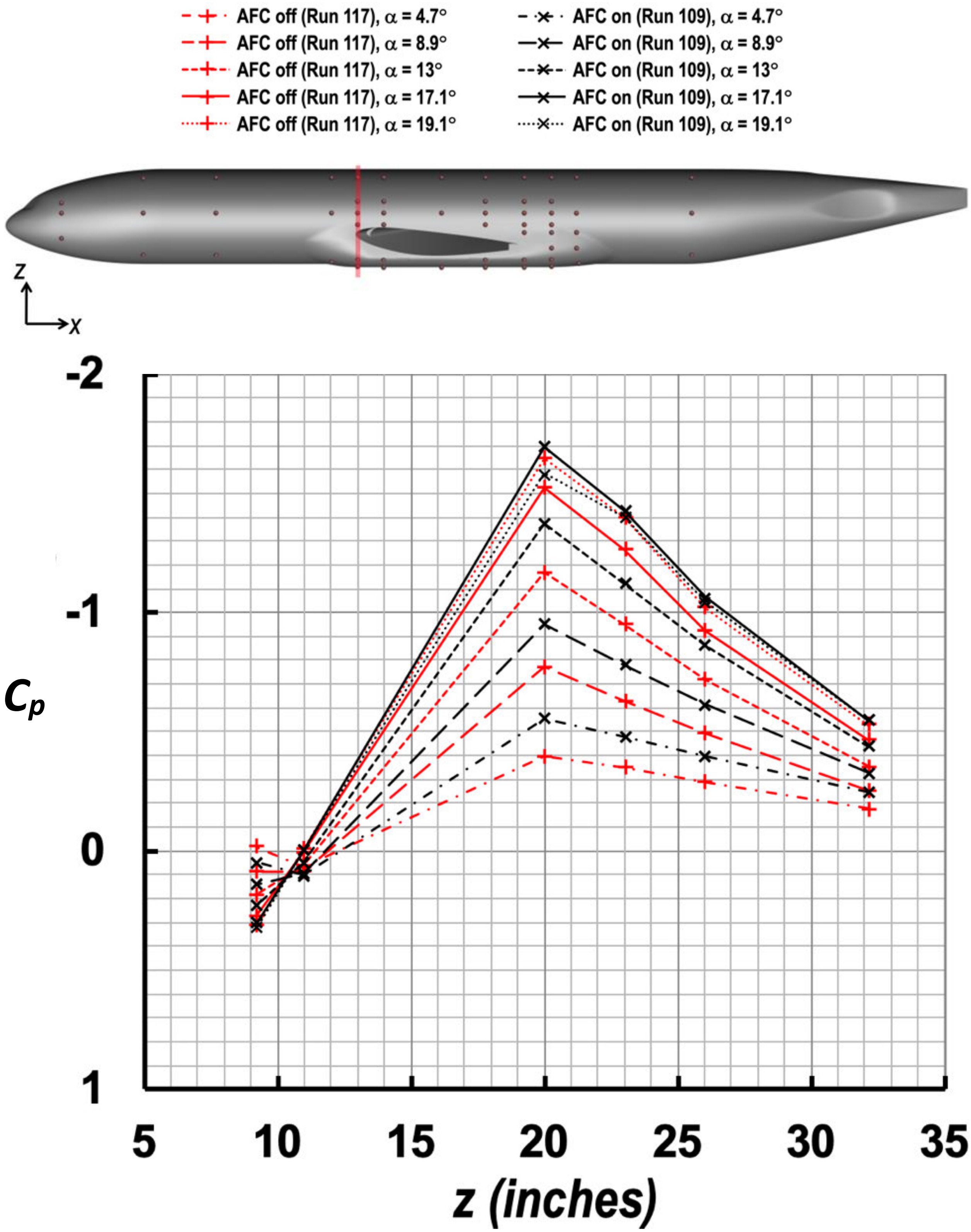


Figure 58. Circumferential C_p distributions at x = 99.7 inches on the fuselage for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack (M_∞ = 0.2, with TWICS).

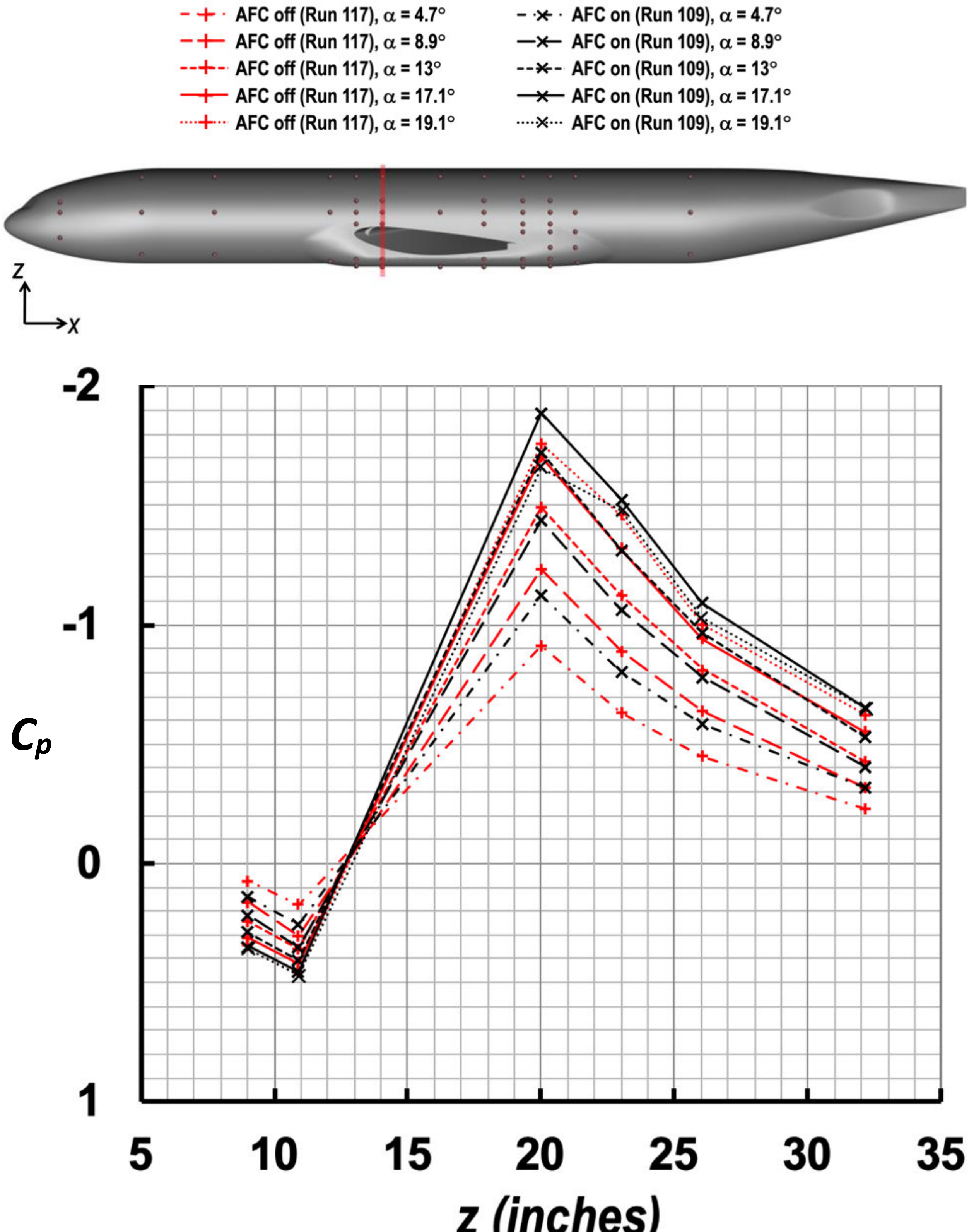


Figure 59. Circumferential C_p distributions at x = 106.4 inches on the fuselage for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack (M_∞ = 0.2, with TWICS).

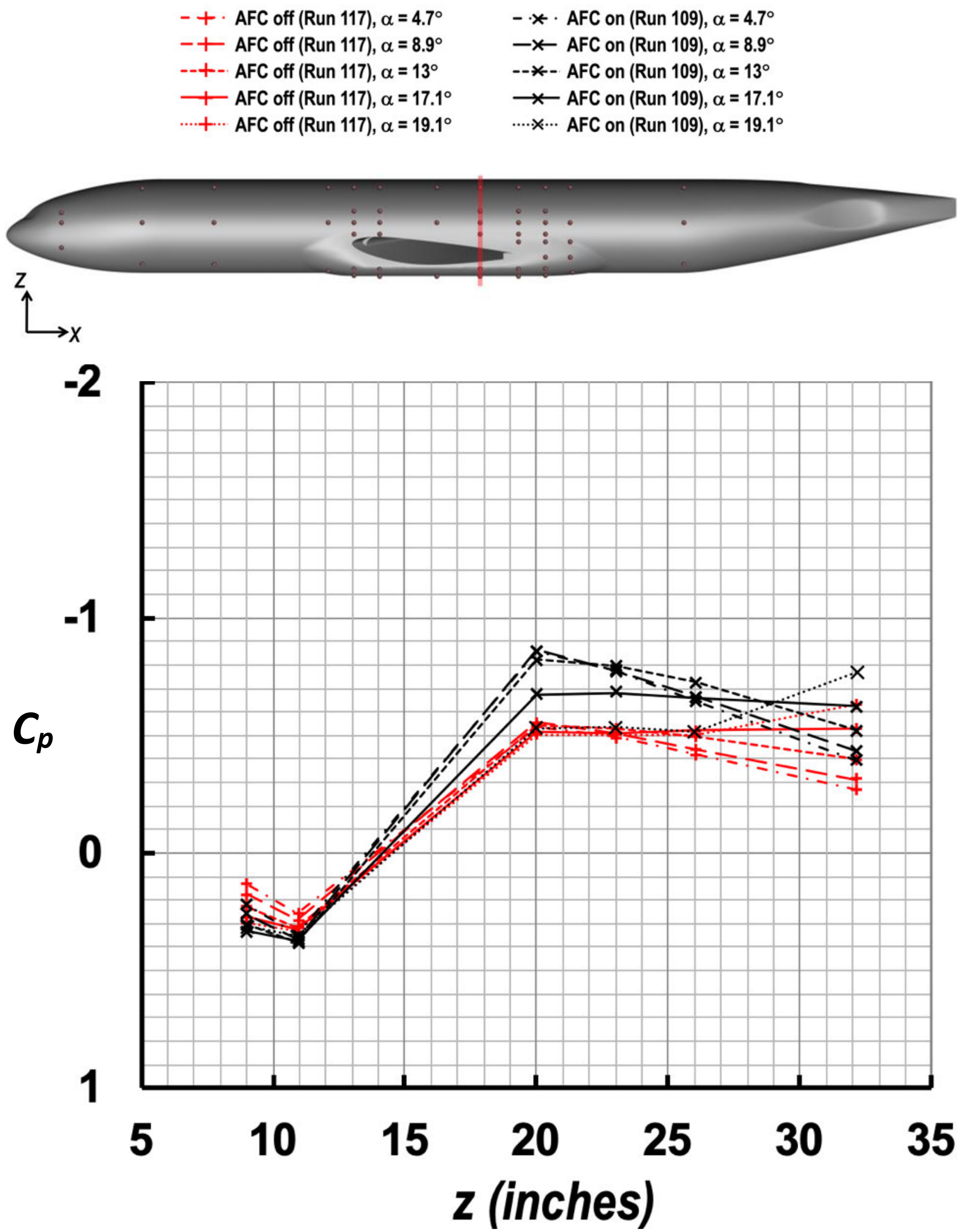


Figure 60. Circumferential C_p distributions at x = 132.5 inches on the fuselage for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack (M_∞ = 0.2, with TWICS).

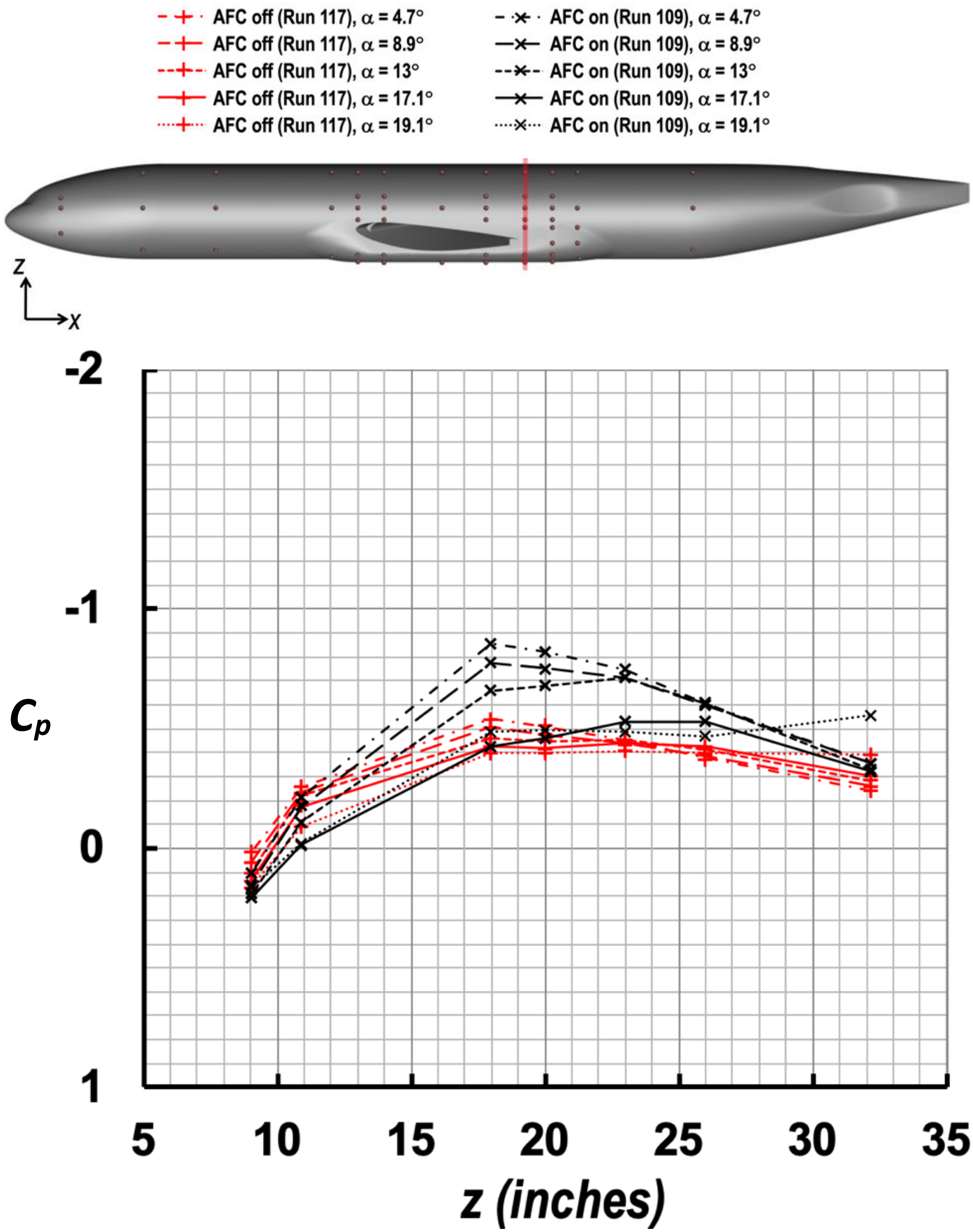


Figure 61. Circumferential C_p distributions at x = 142.5 inches on the fuselage for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack (M_∞ = 0.2, with TWICS).

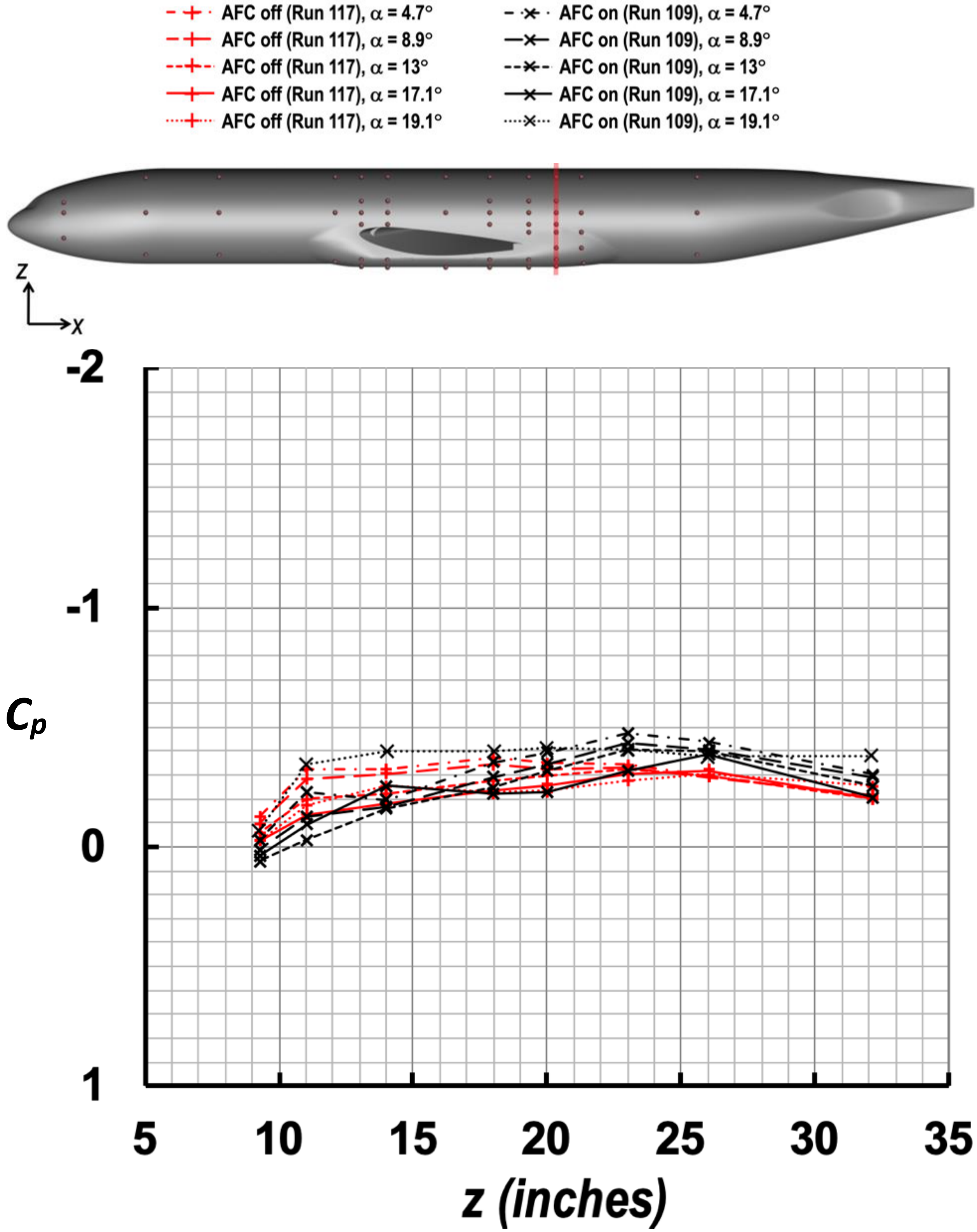


Figure 62. Circumferential C_p distributions at x = 149.5 inches on the fuselage for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack (M_∞ = 0.2, with TWICS).

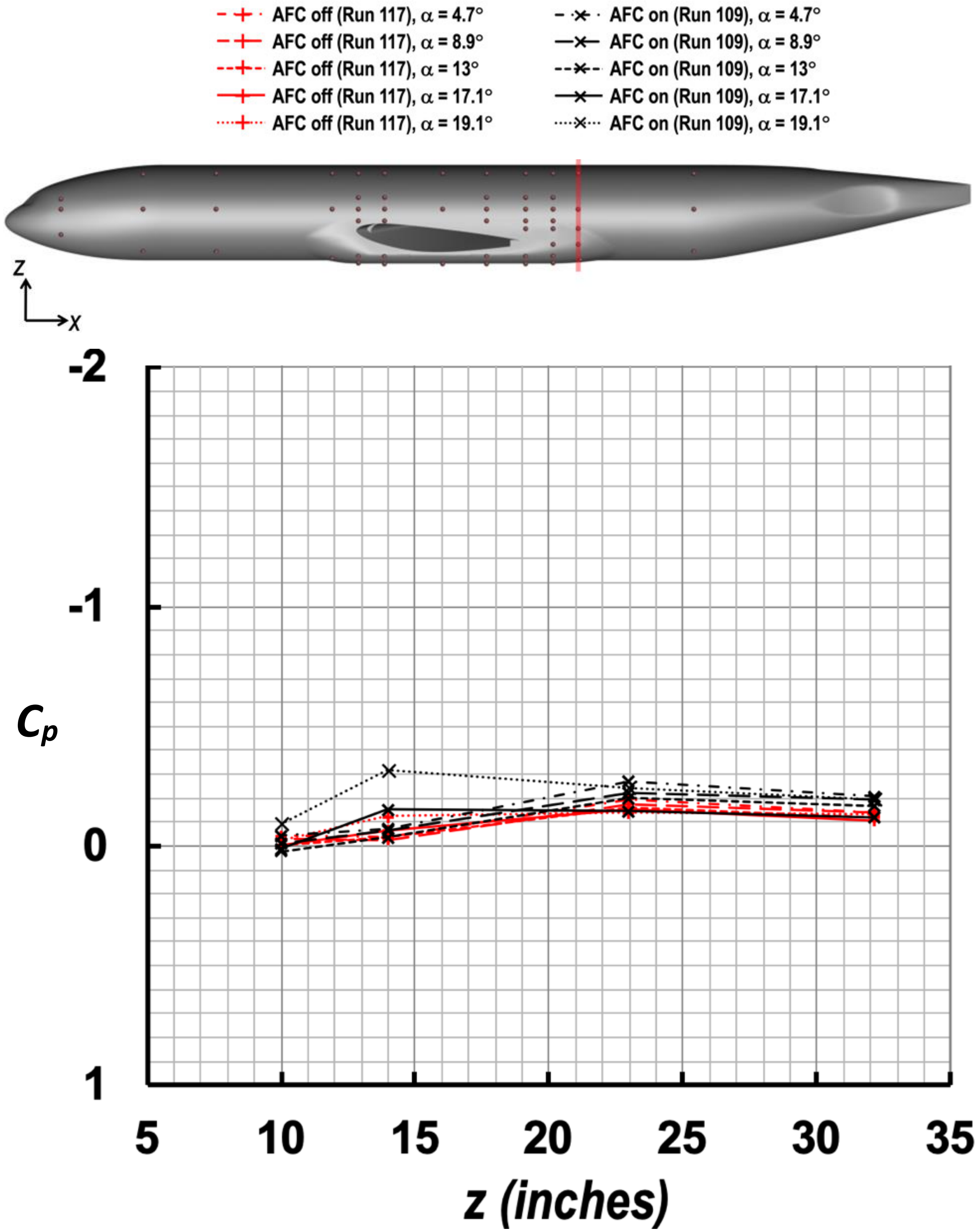


Figure 63. Circumferential C_p distributions at x = 156.5 inches on the fuselage for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack (M_∞ = 0.2, with TWICS).

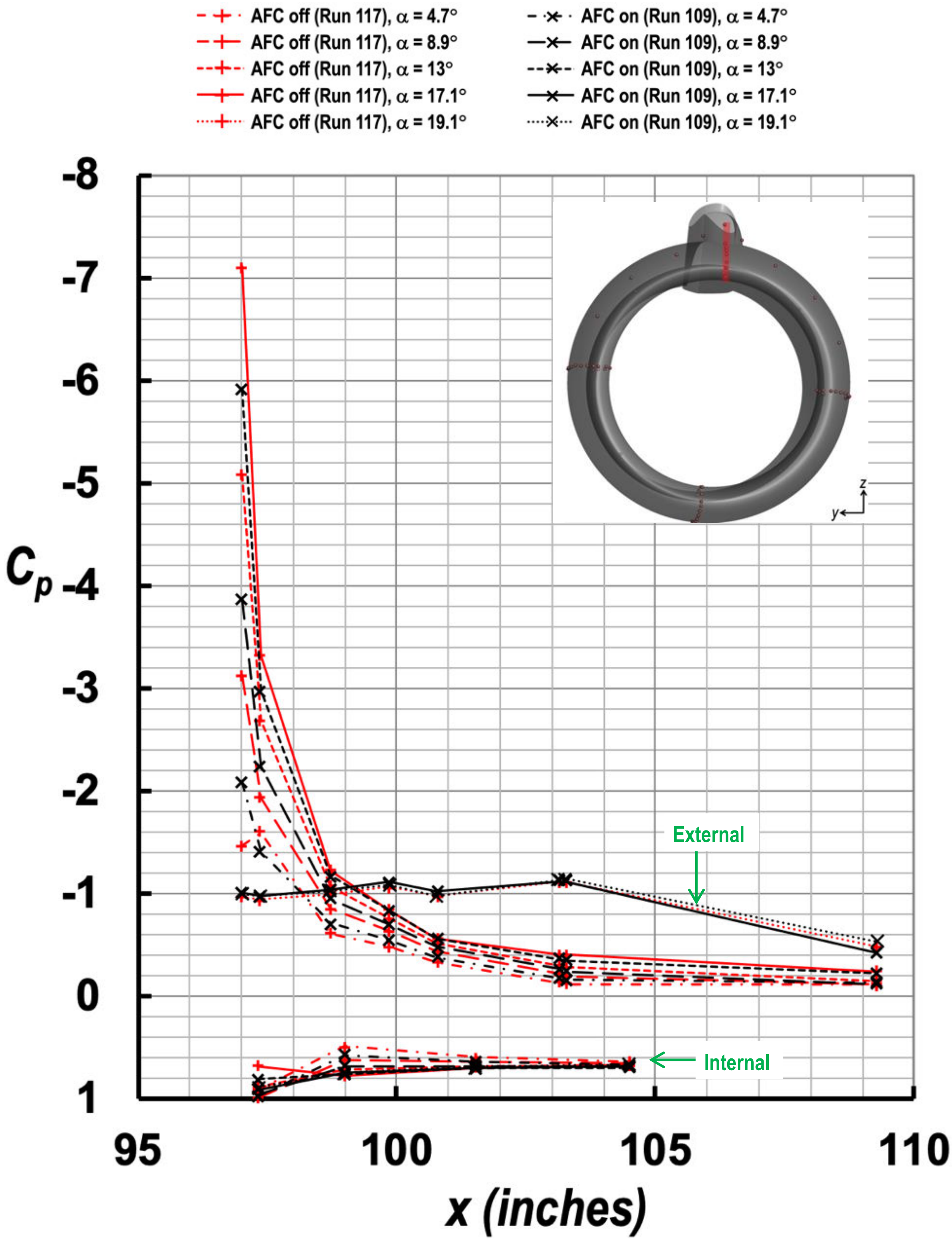


Figure 64. Streamwise C_p distributions of the 12 o'clock row on the nacelle for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack ($M_\infty = 0.2$, with TWICS).

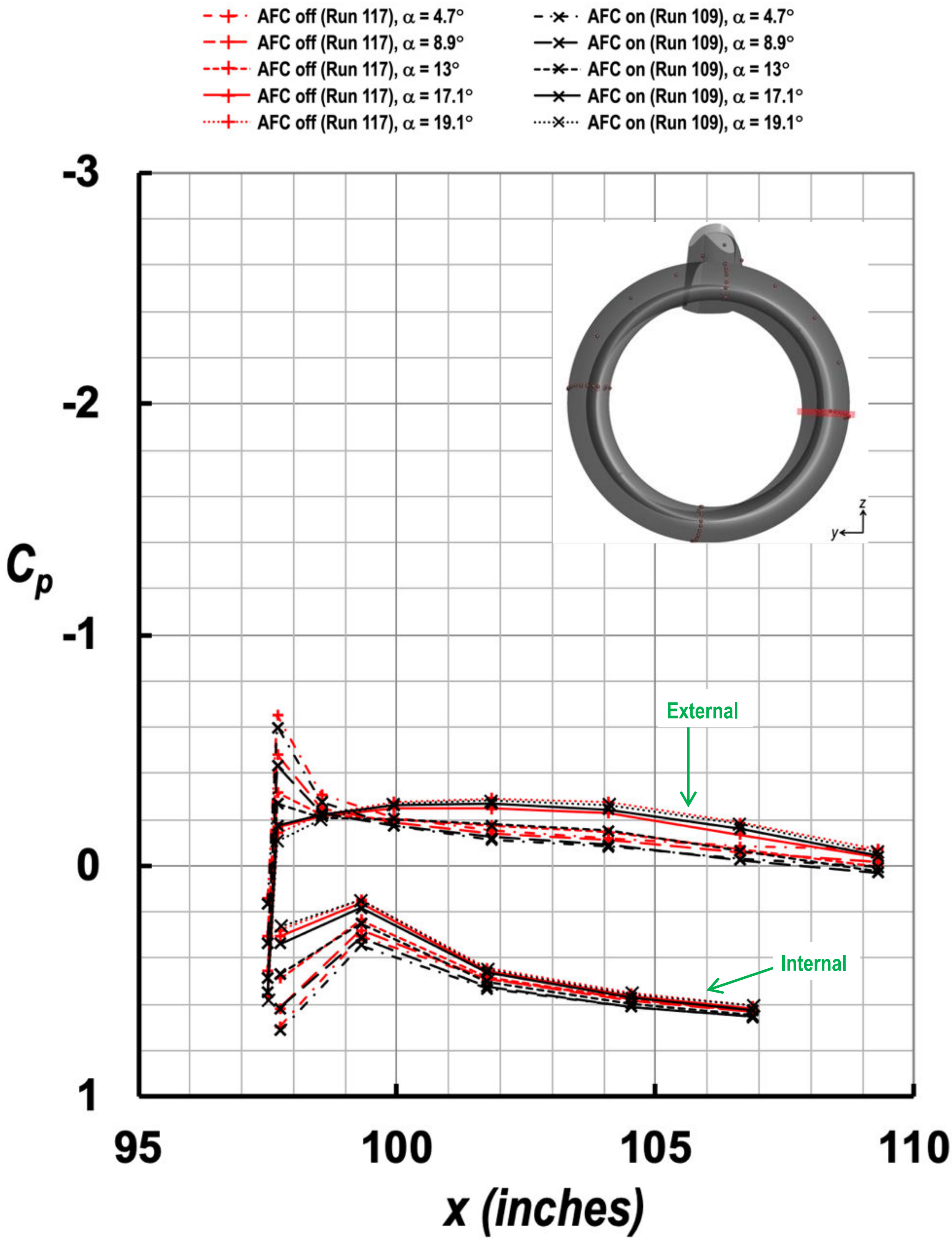


Figure 65. Streamwise C_p distributions of the 3 o'clock row on the nacelle for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack ($M_\infty = 0.2$, with TWICS).

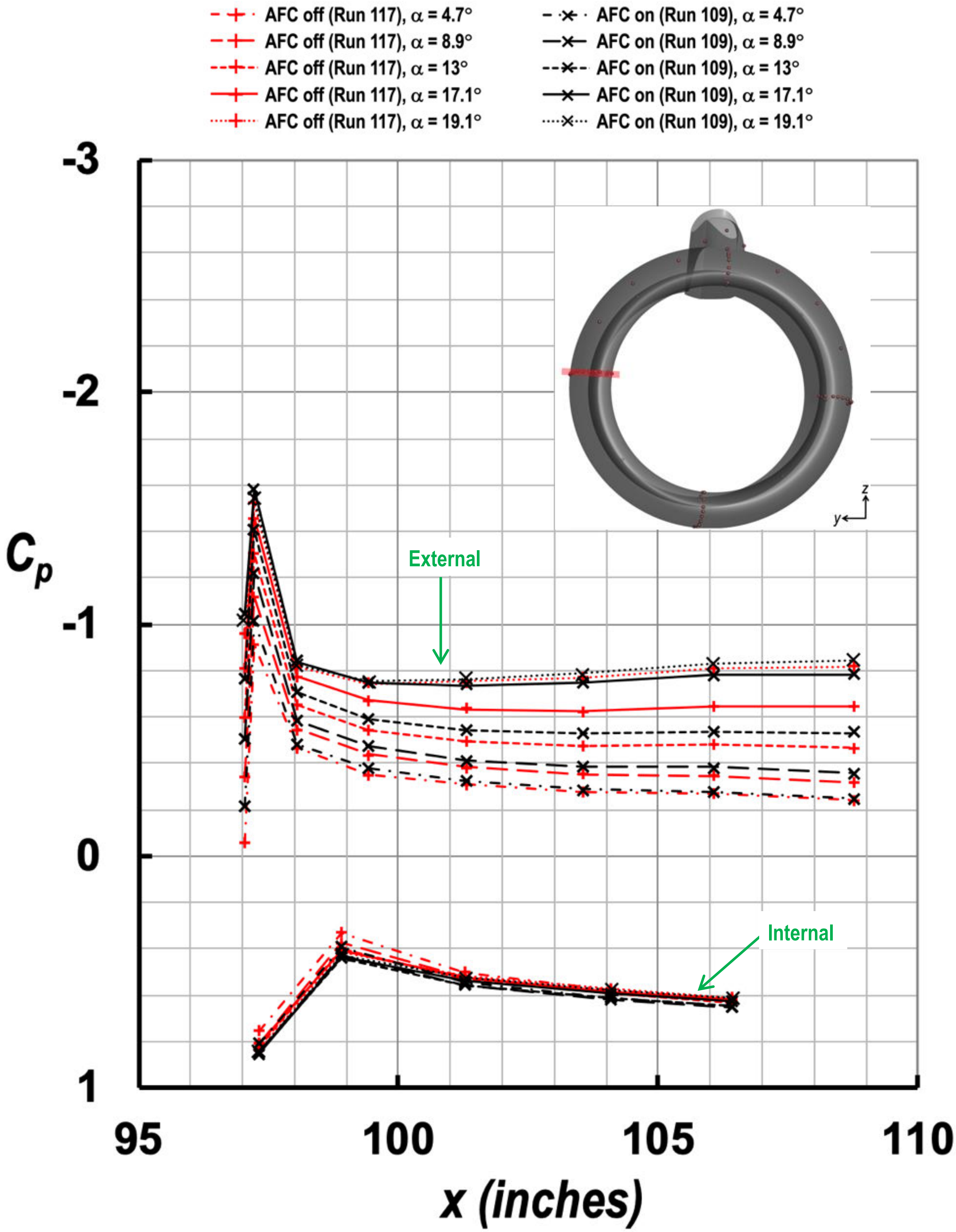


Figure 66. Streamwise C_p distributions of the 9 o'clock row on the nacelle for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack ($M_\infty = 0.2$, with TWICS).

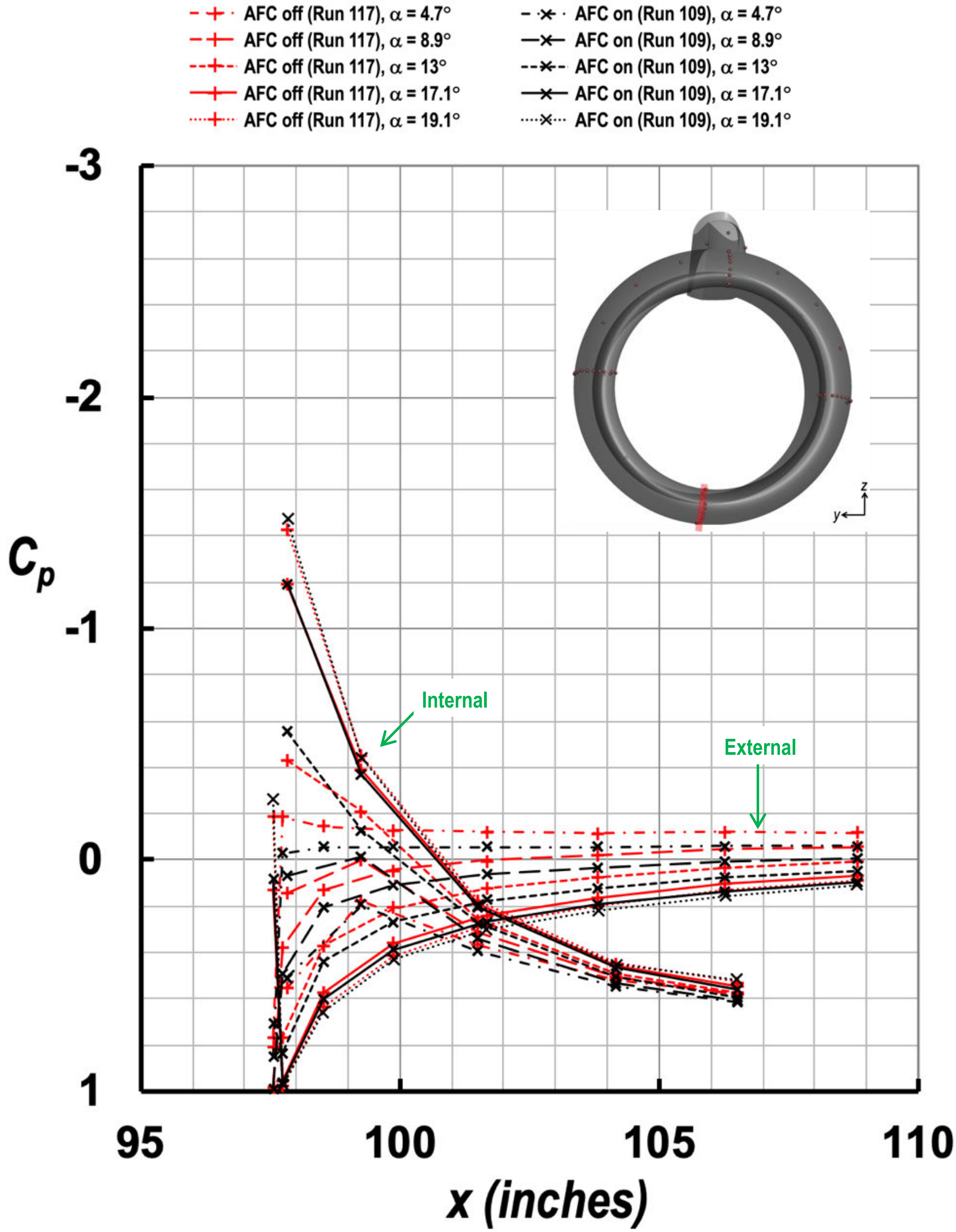


Figure 67. Streamwise C_p distributions of the 6 o'clock row on the nacelle for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack ($M_\infty = 0.2$, with TWICS).

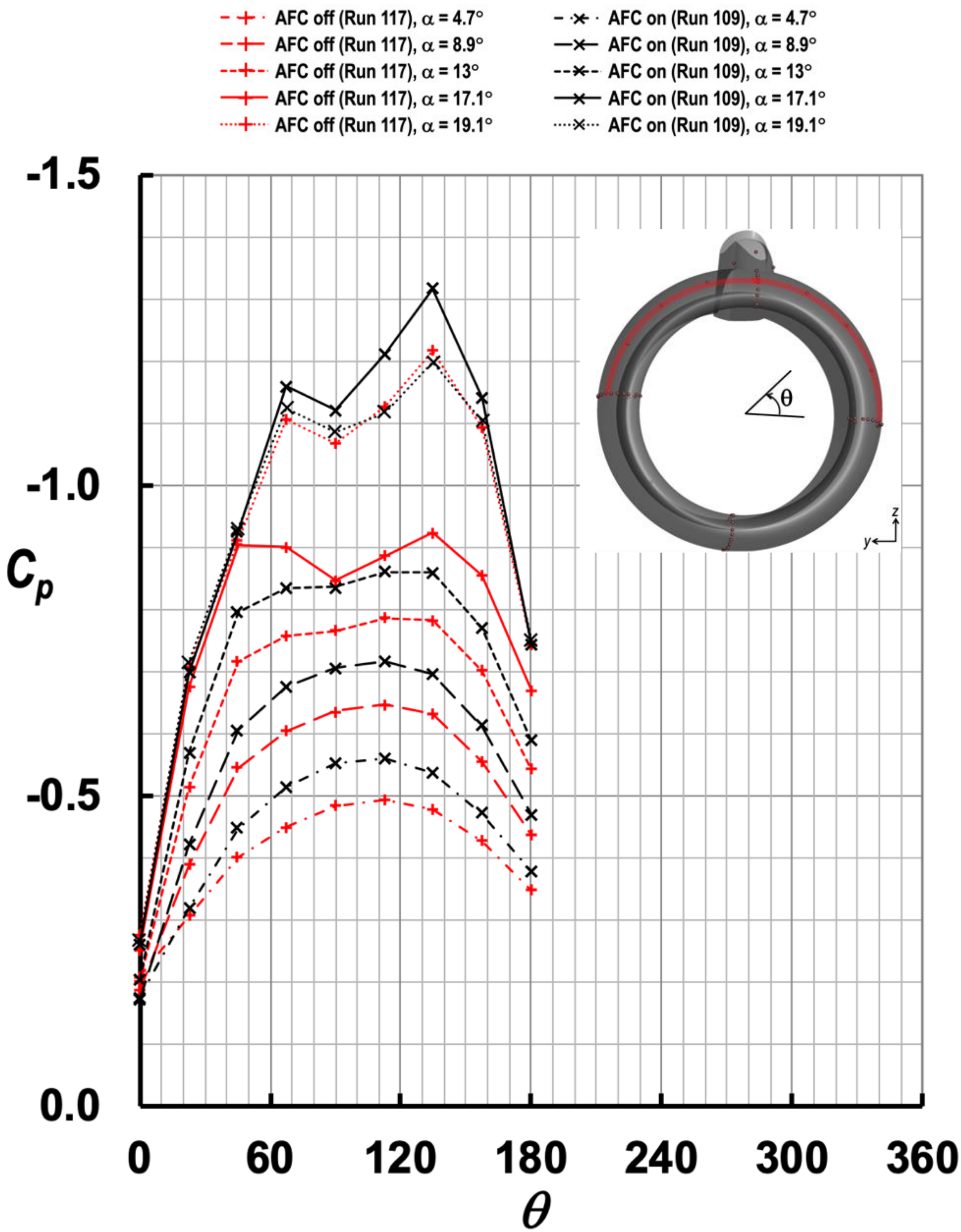


Figure 68. Circumferential C_p distributions at $x \approx 99.8$ inches on the nacelle exterior for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack ($M_\infty = 0.2$, with TWICS).

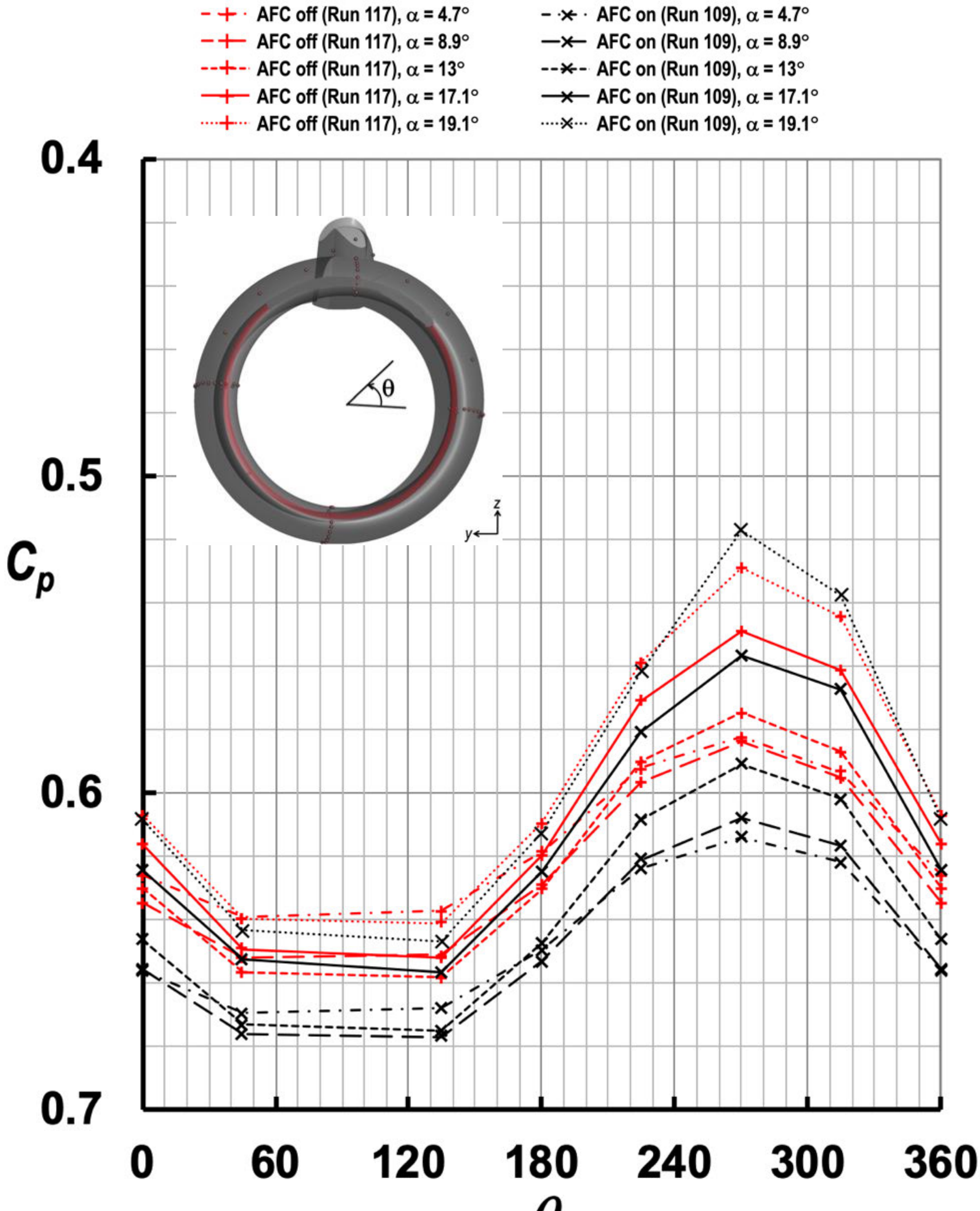


Figure 69. Circumferential C_p distributions at $x \approx 106.6$ inches on the nacelle interior for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack ($M_\infty = 0.2$, with TWICS).

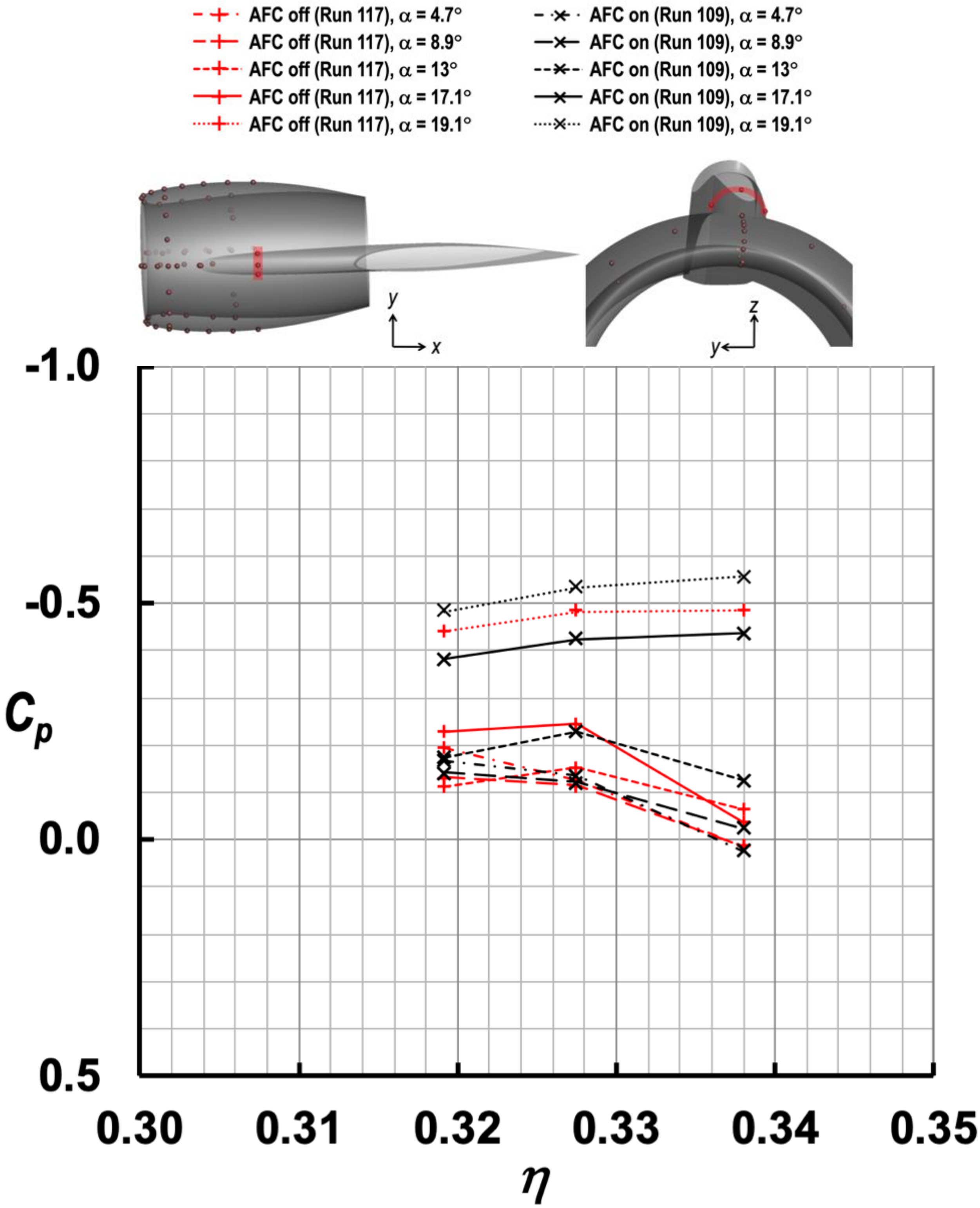
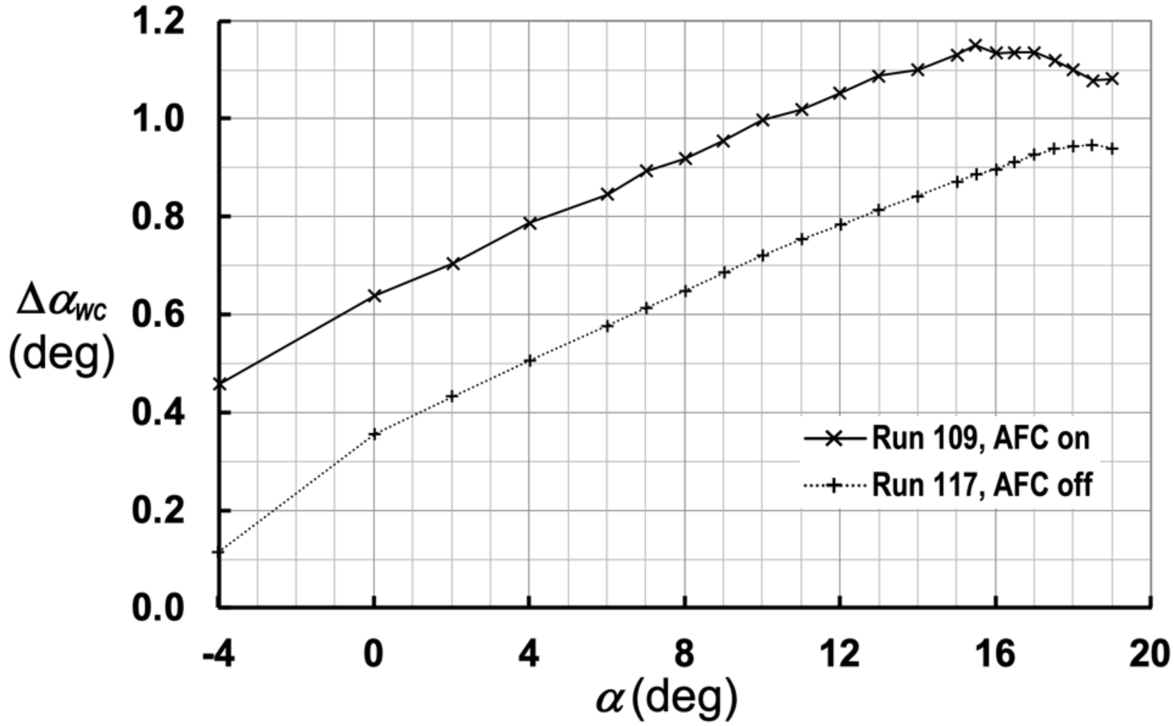
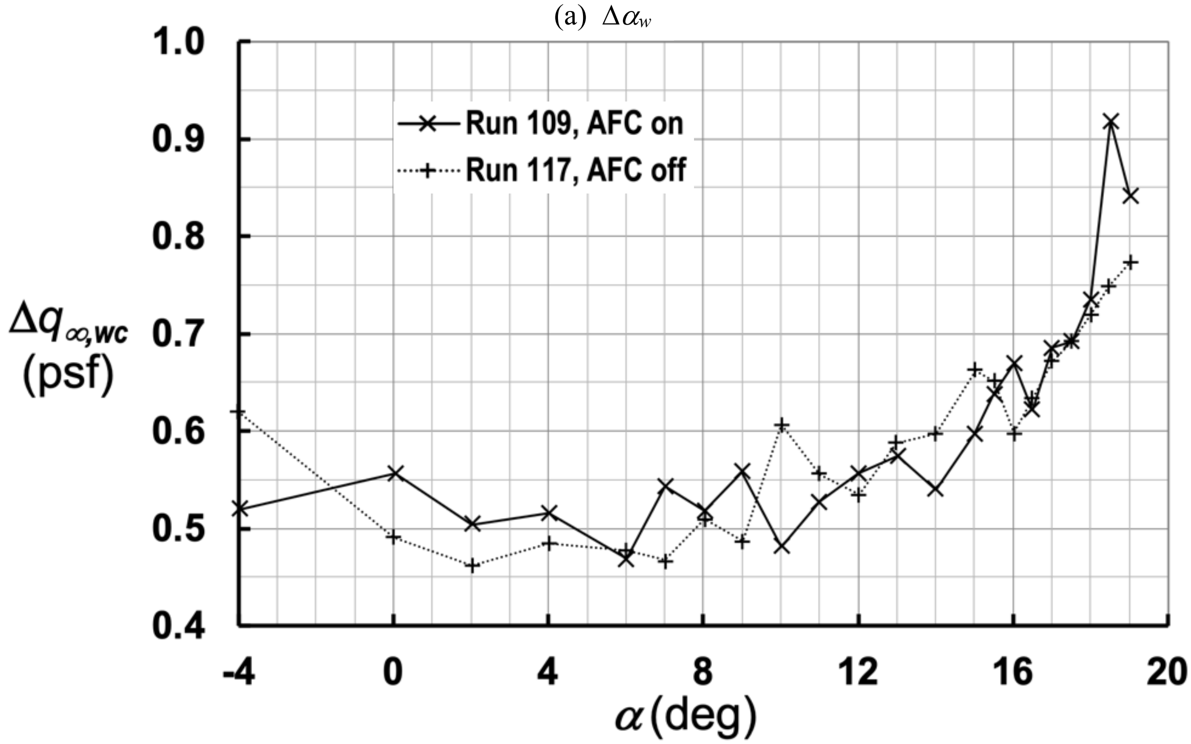


Figure 70. Spanwise C_p distributions at x = 109.2 inches on the pylon for CRM-SHL-AFC with and without the best-case HELP actuation at 5 angles of attack (M_∞ = 0.2, with TWICS).

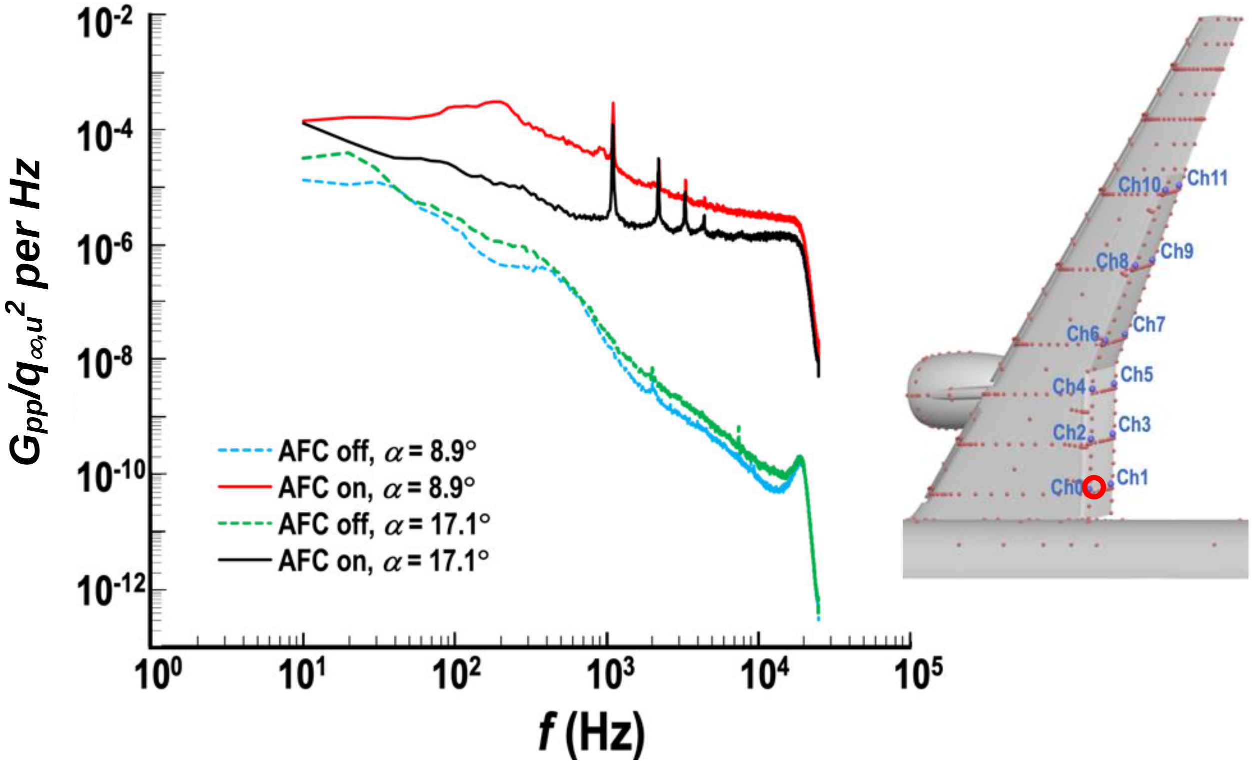


(a) $\Delta\alpha_w$

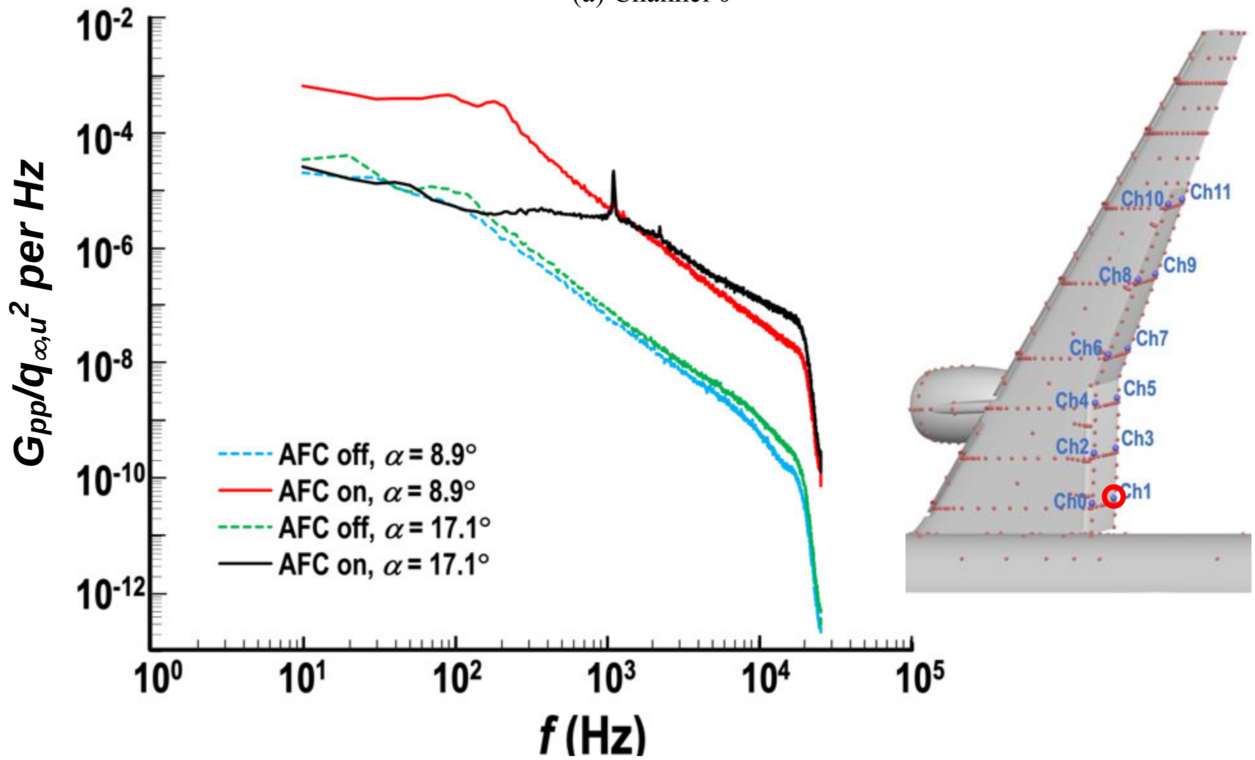


(b) $\Delta q_{\infty,w}$

Figure 71. Variations of $\Delta\alpha_{wc}$ and $\Delta q_{\infty,wc}$ as a function of uncorrected α due to TWICS ($M_\infty = 0.2$).

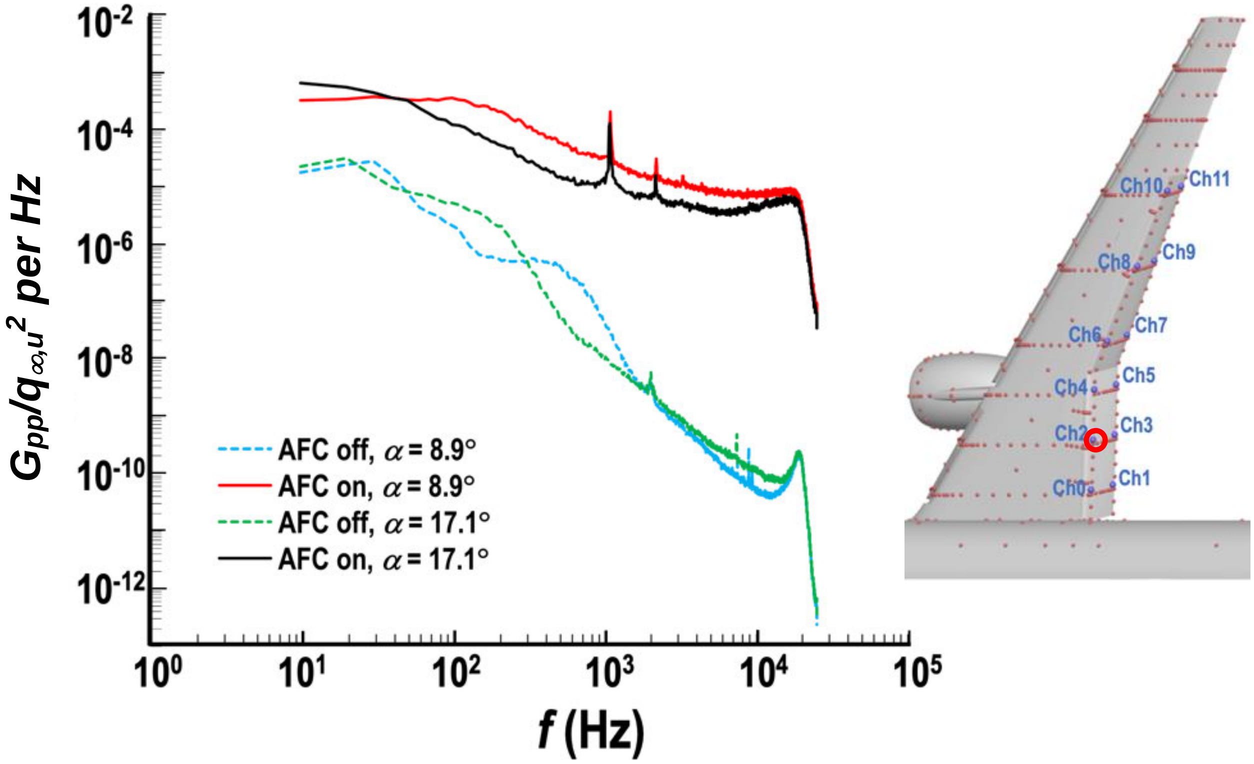


(a) Channel 0

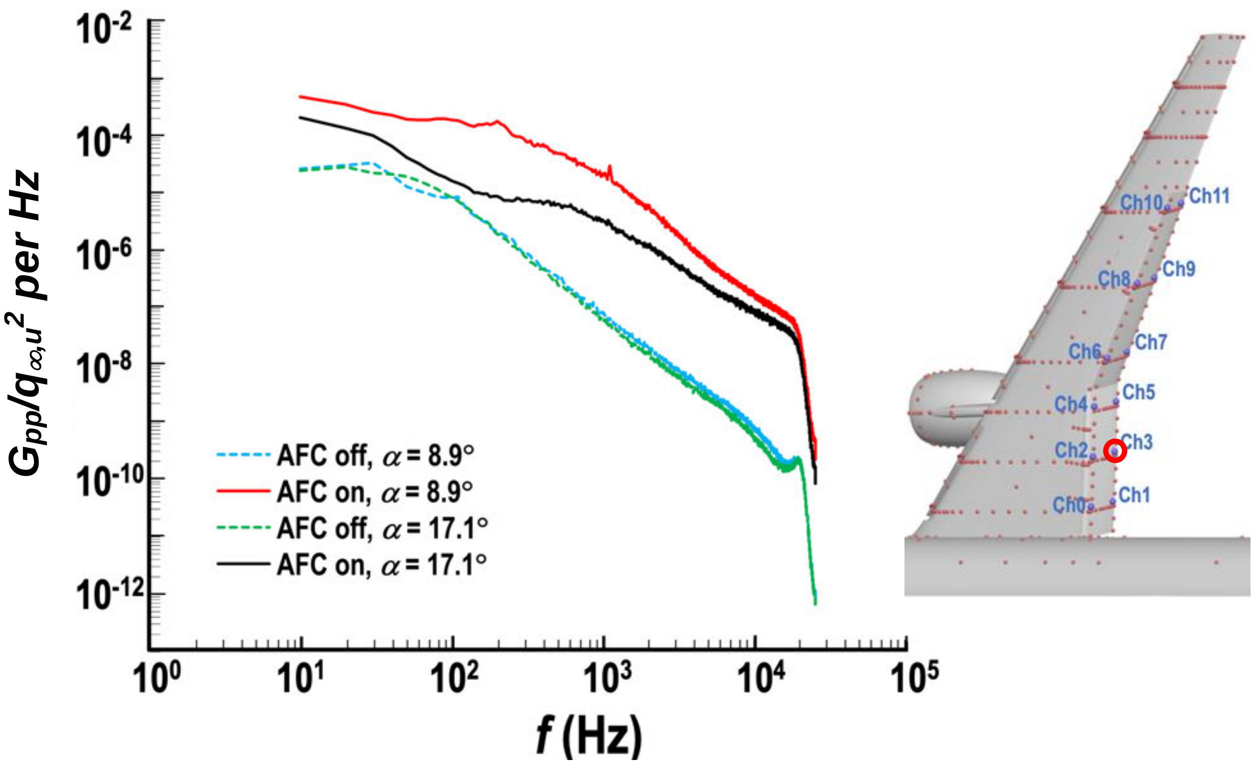


(b) Channel 1

Figure 72. Normalized autospectral density for Channels 0 and 1 on the simple-hinged flaps at $\eta \sim 0.15$ with and without the best-case HELP actuation at 8.9° and 17.1° angles of attack ($M_\infty = 0.2$, with TWICS).

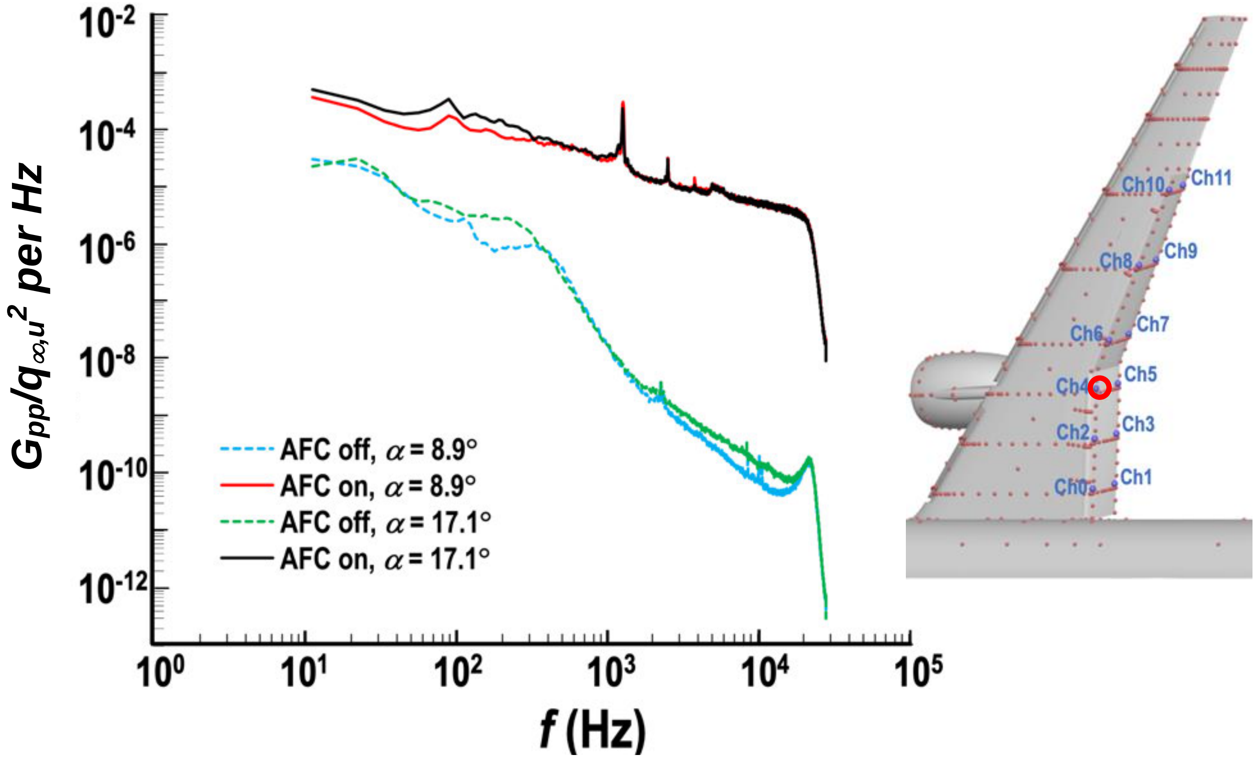


(a) Channel 2

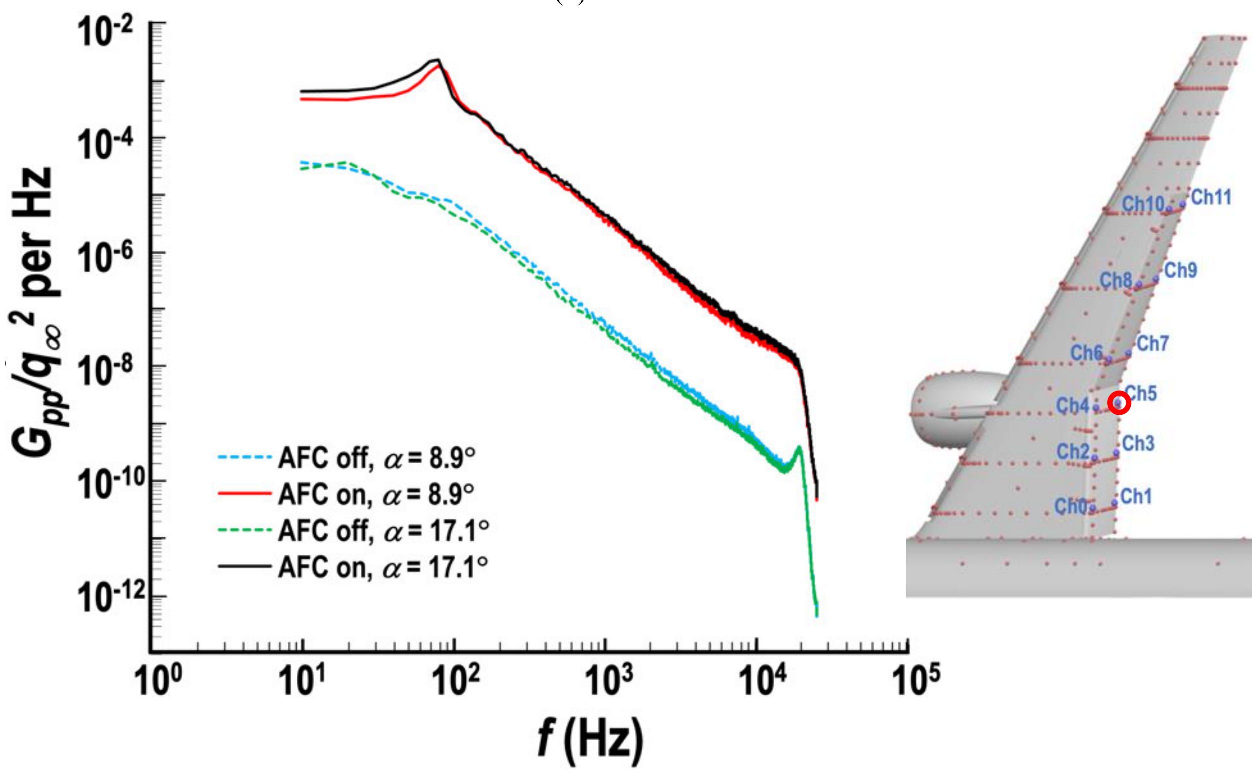


(b) Channel 3

Figure 73. Normalized autospectral density for Channels 2 and 3 on the simple-hinged flaps at $\eta \sim 0.24$ with and without the best-case HELP actuation at 8.9° and 17.1° angles of attack (M_∞ = 0.2, with TWICS).

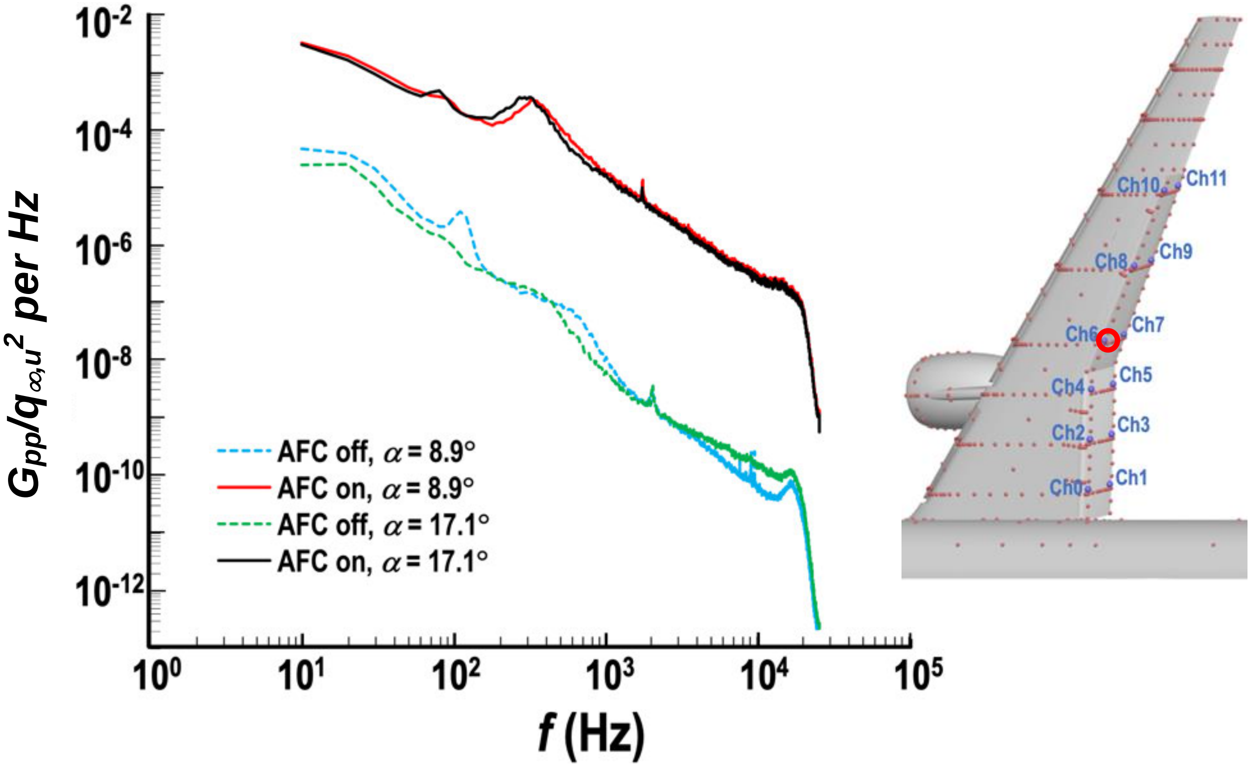


(a) Channel 4

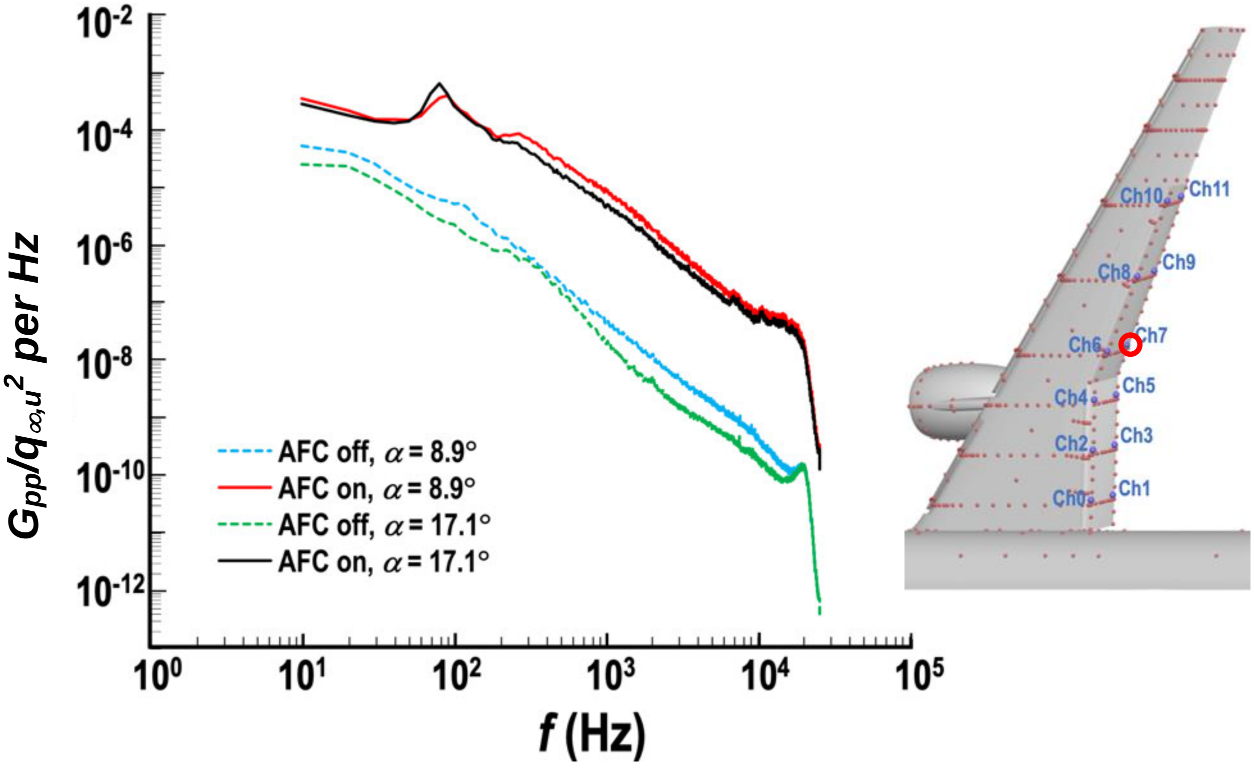


(b) Channel 5

Figure 74. Normalized autospectral density for Channels 4 and 5 on the simple-hinged flaps at $\eta \sim 0.33$ with and without the best-case HELP actuation at 8.9° and 17.1° angles of attack ($M_\infty = 0.2$, with TWICS).

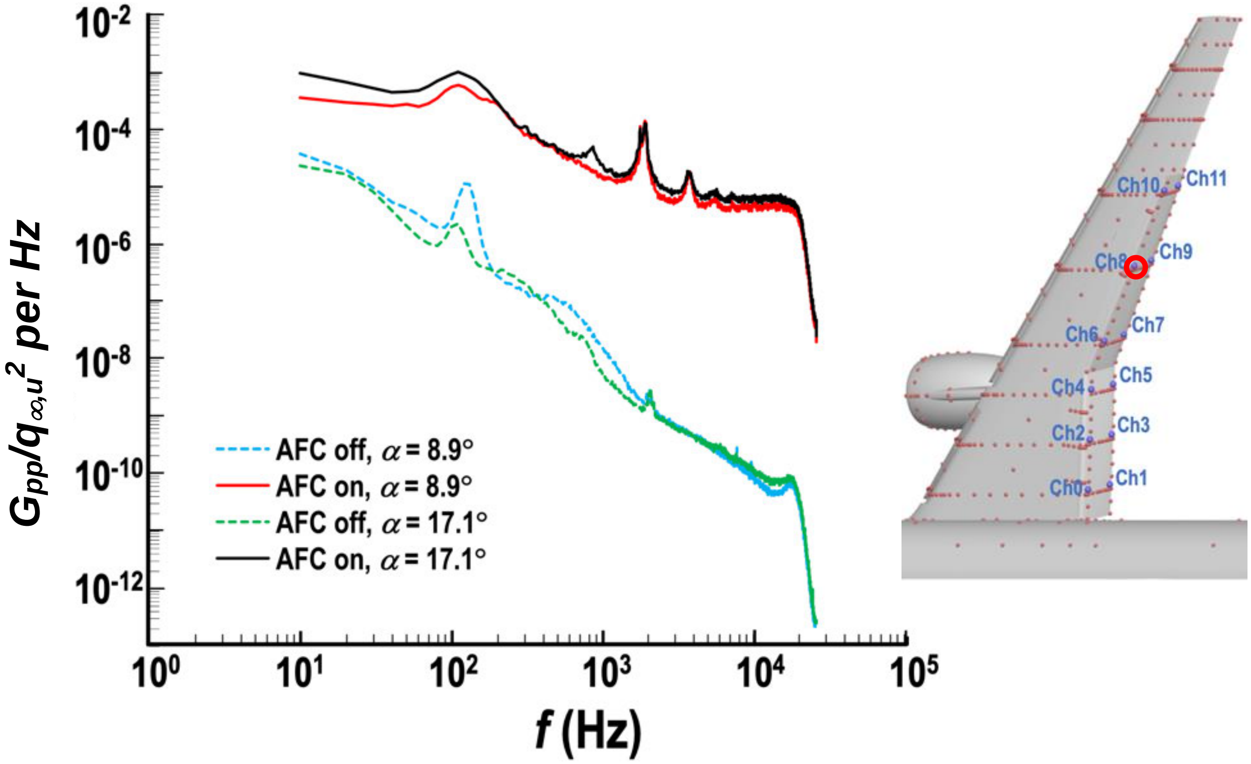


(a) Channel 6

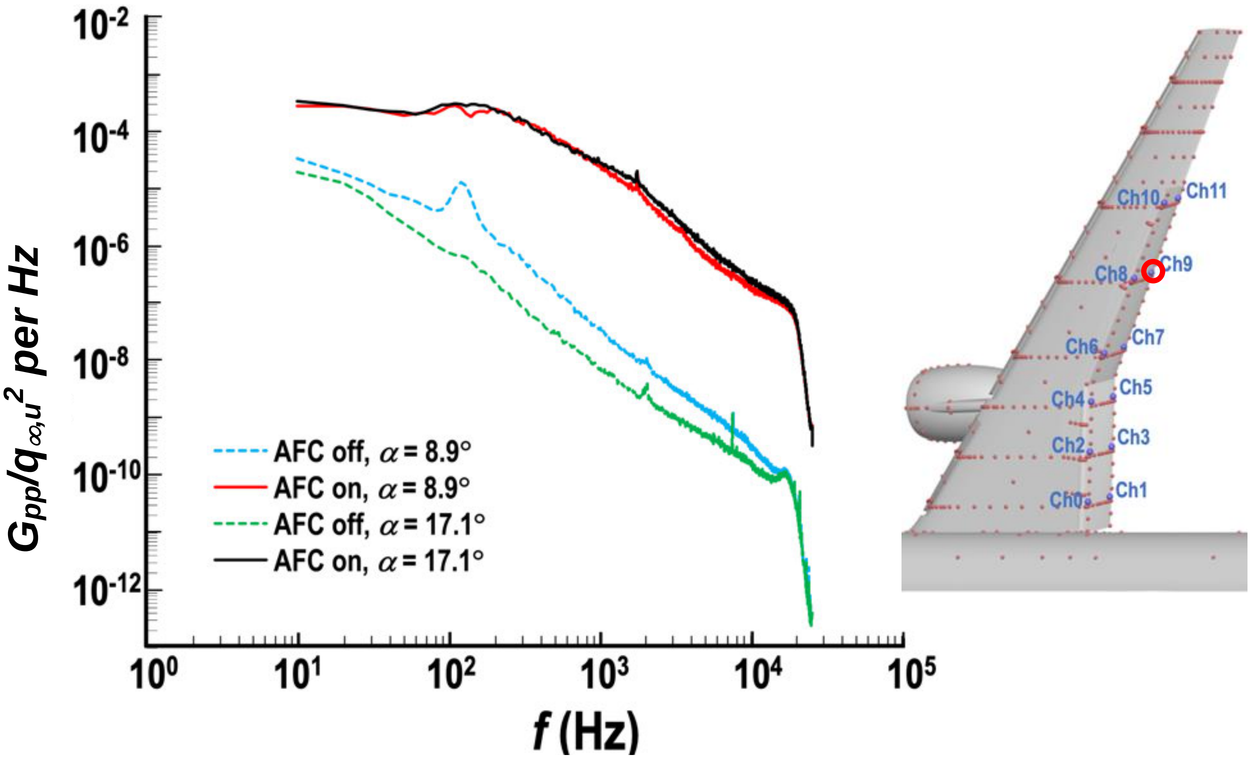


(b) Channel 7

Figure 75. Normalized autospectral density for Channels 6 and 7 on the simple-hinged flaps at $\eta \sim 0.33$ with and without the best-case HELP actuation at 8.9° and 17.1° angles of attack ($M_\infty = 0.2$, with TWICS).

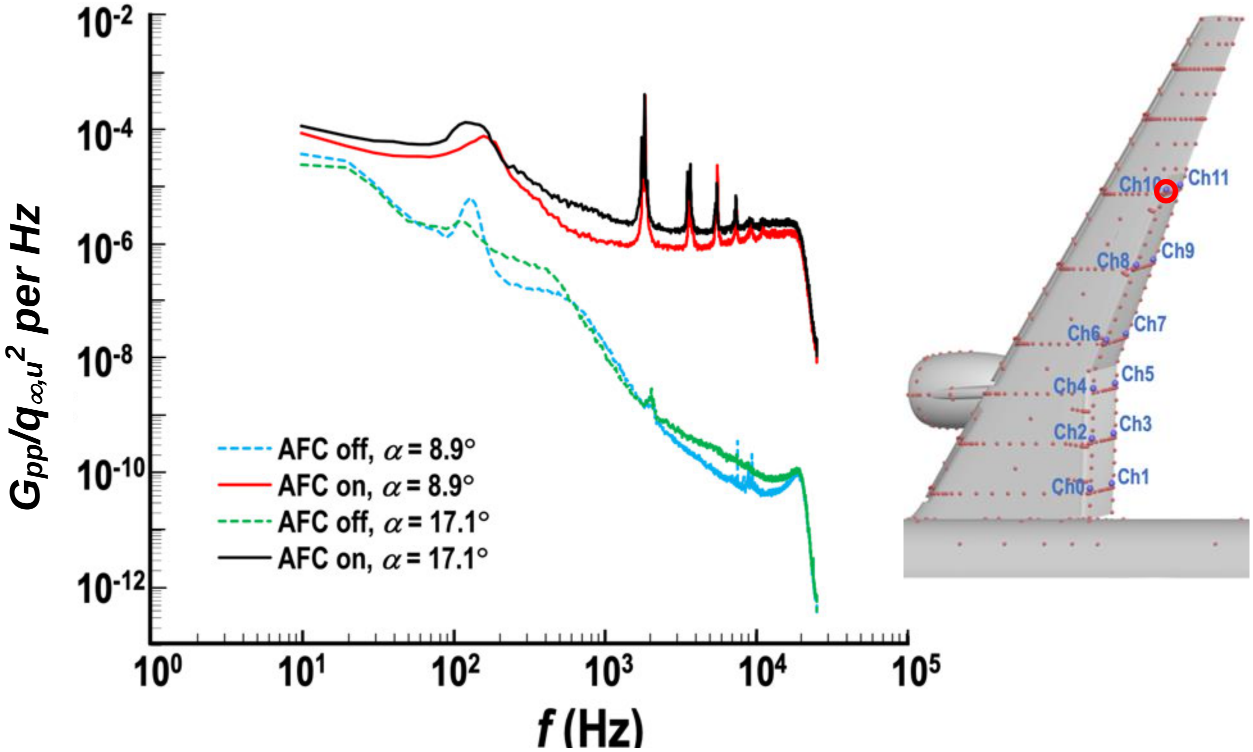


(a) Channel 8

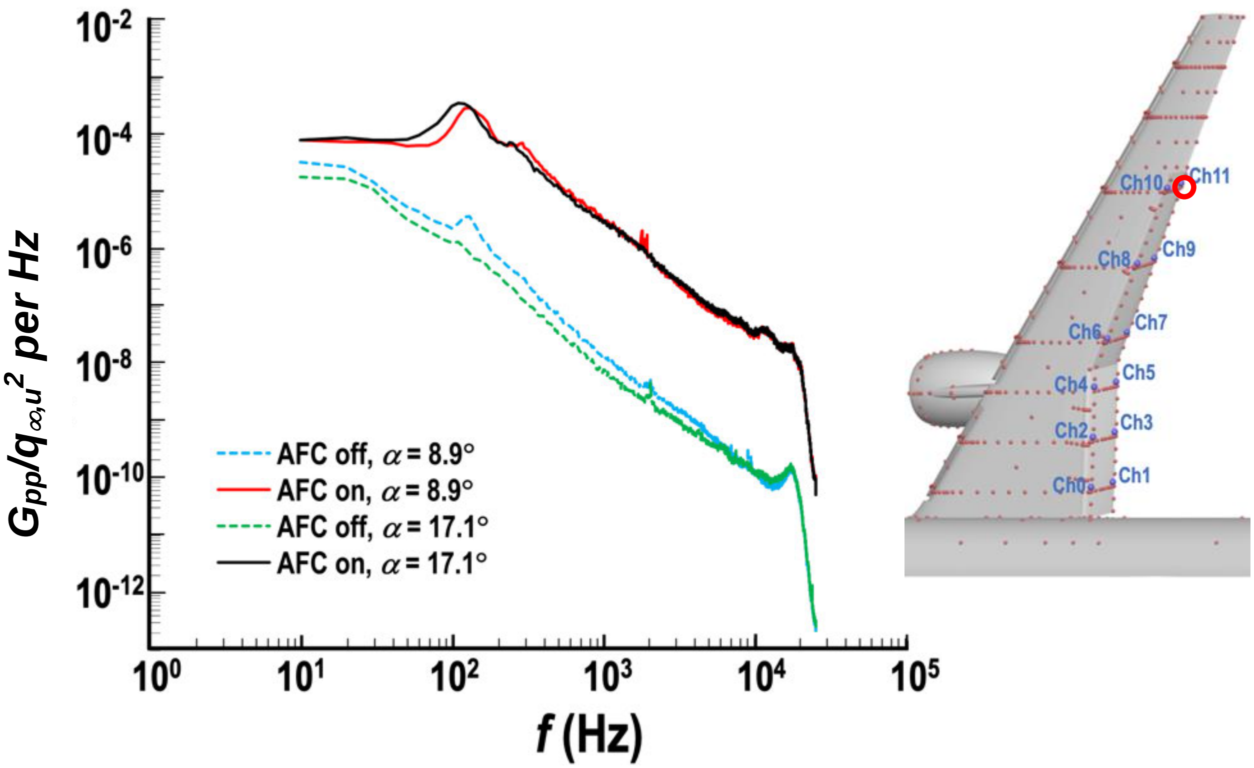


(b) Channel 9

Figure 76. Normalized autospectral density for Channels 8 and 9 on the simple-hinged flaps at $\eta \sim 0.55$ with and without the best-case HELP actuation at 8.9° and 17.1° angles of attack (M_∞ = 0.2, with TWICS).

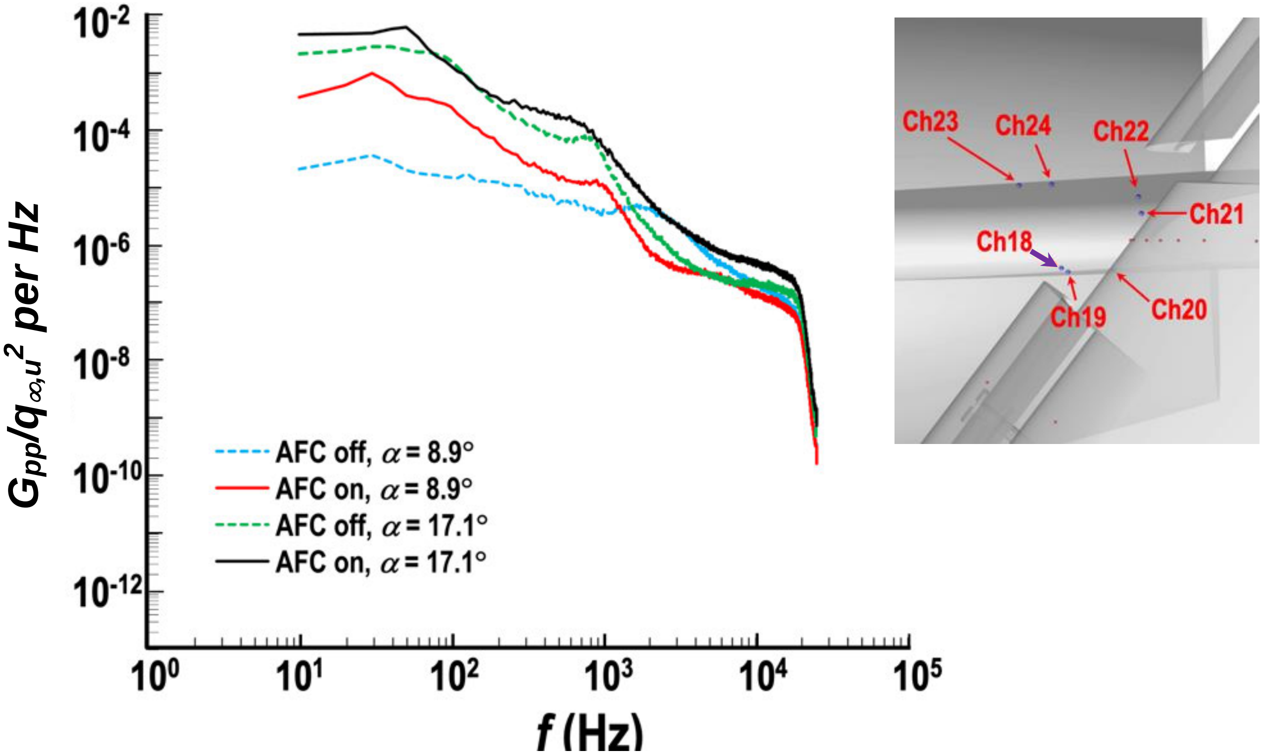


(a) Channel 10

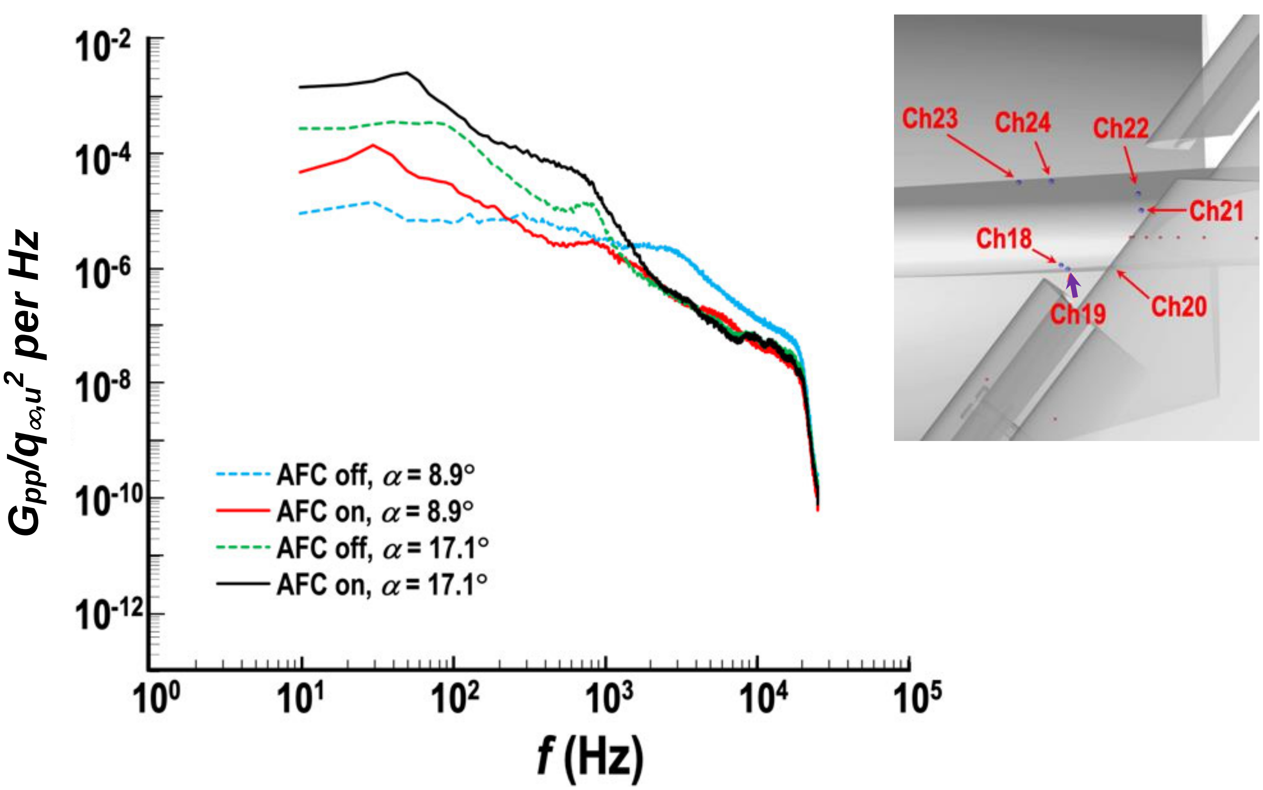


(b) Channel 11

Figure 77. Normalized autospectral density for Channels 10 and 11 on the simple-hinged flaps at $\eta \sim 0.69$ with and without the best-case HELP actuation at 8.9° and 17.1° angles of attack ($M_\infty = 0.2$, with TWICS).

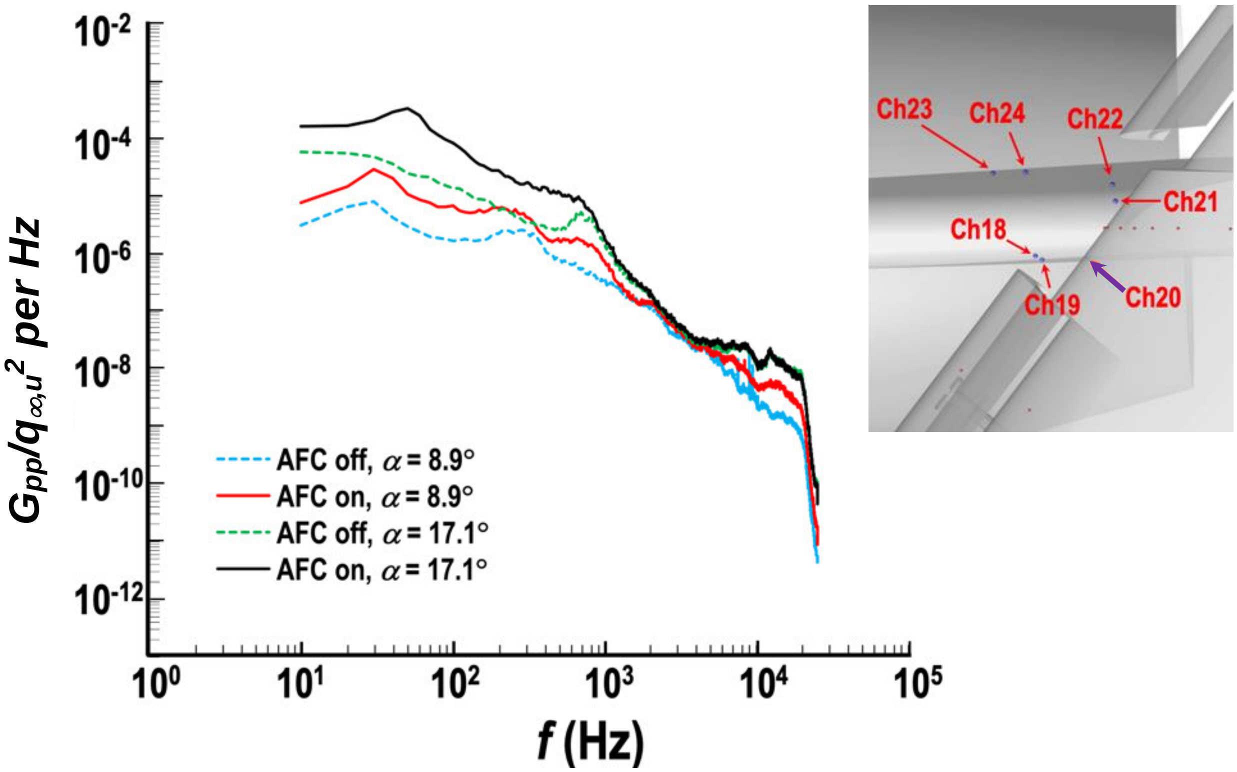


(a) Channel 18

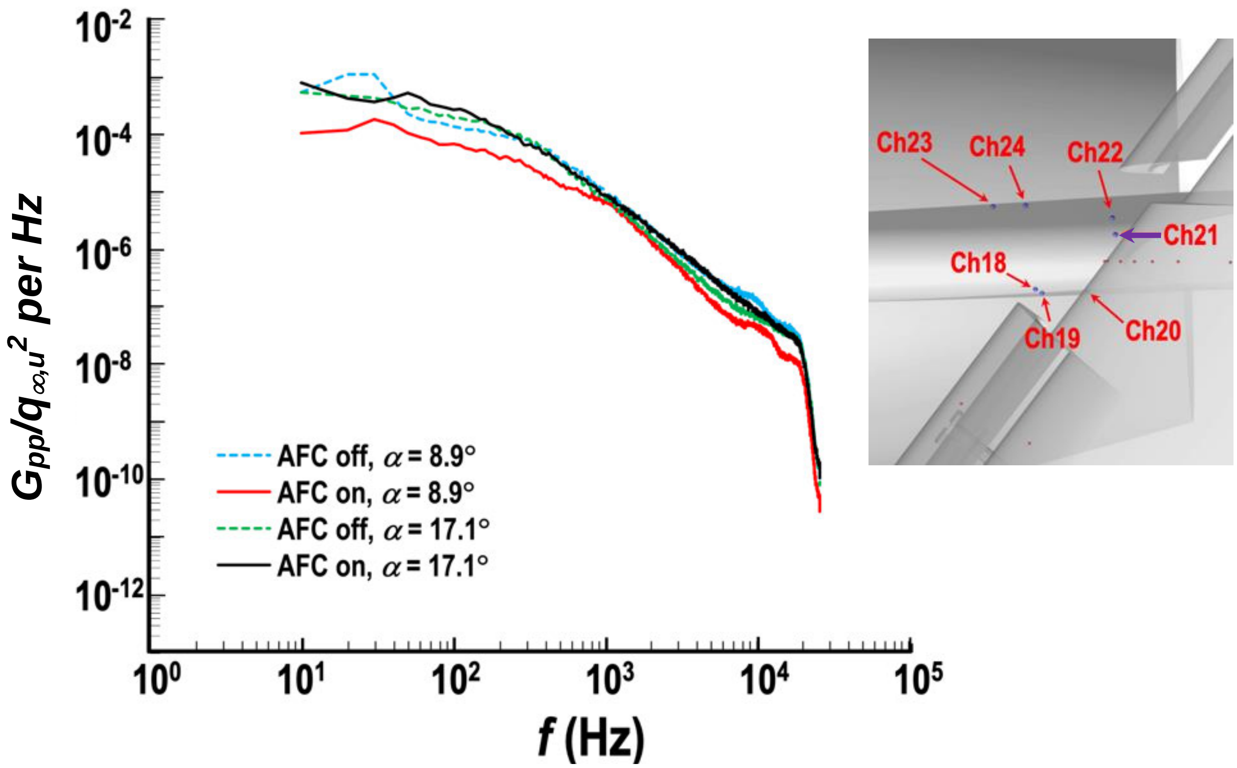


(b) Channel 19

Figure 78. Normalized autospectral density for Channels 18 and 19 on the pylon with and without the best-case HELP actuation at 8.9° and 17.1° angles of attack (M_∞ = 0.2, with TWICS).

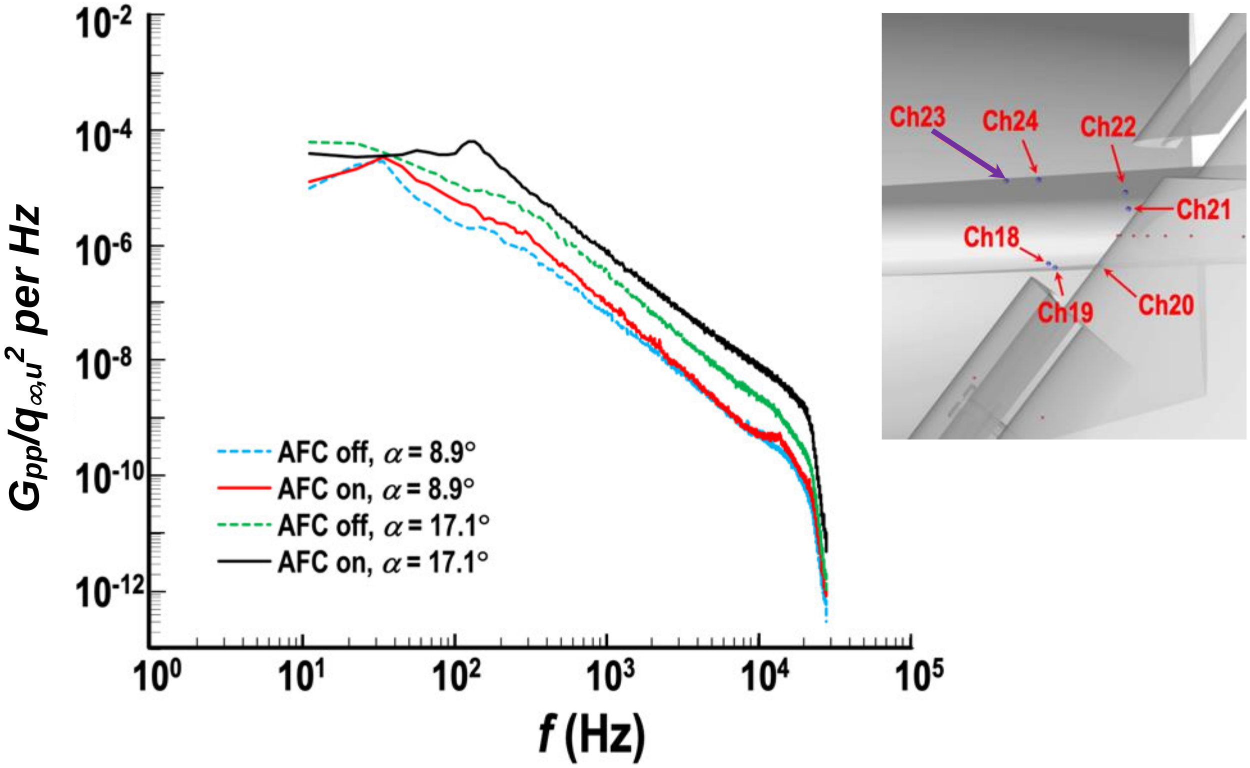


(a) Channel 20 (located just below the slatless WUSS)

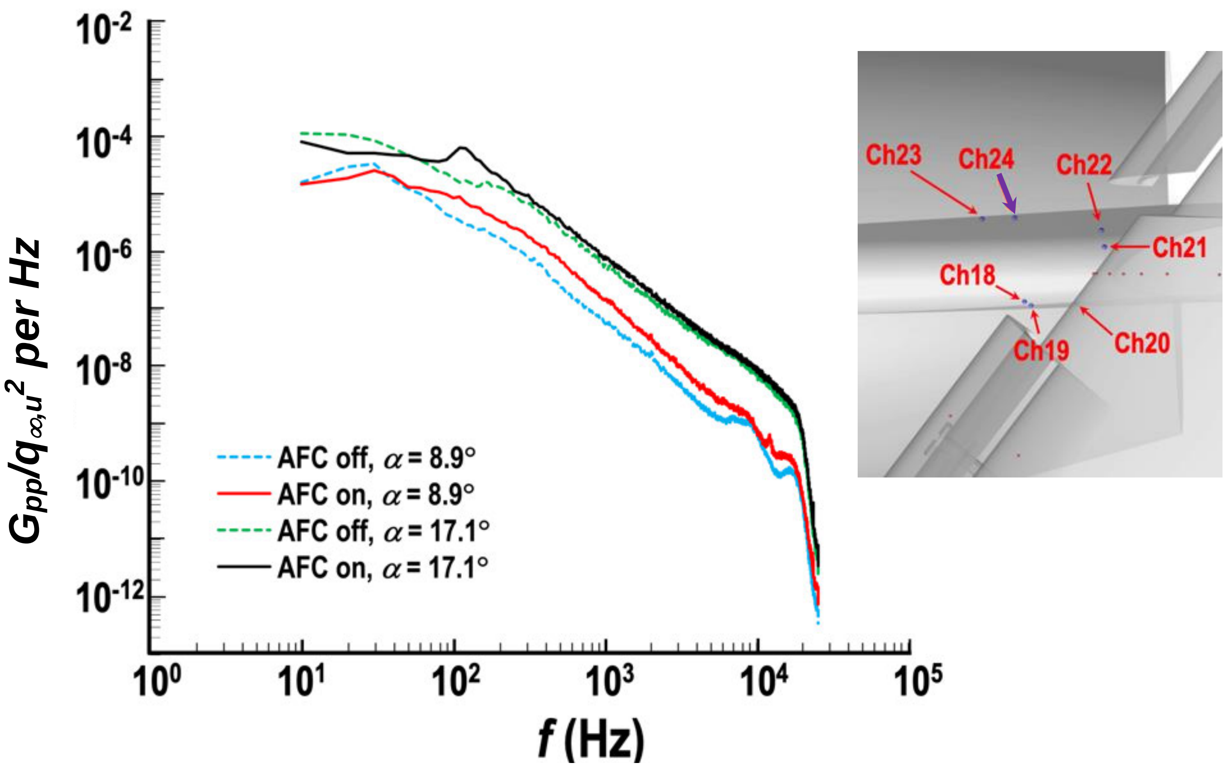


(b) Channel 21

Figure 79. Normalized autospectral density for Channels 20 and 21 on the pylon with and without the best-case HELP actuation at 8.9° and 17.1° angles of attack (M_∞ = 0.2, with TWICS).

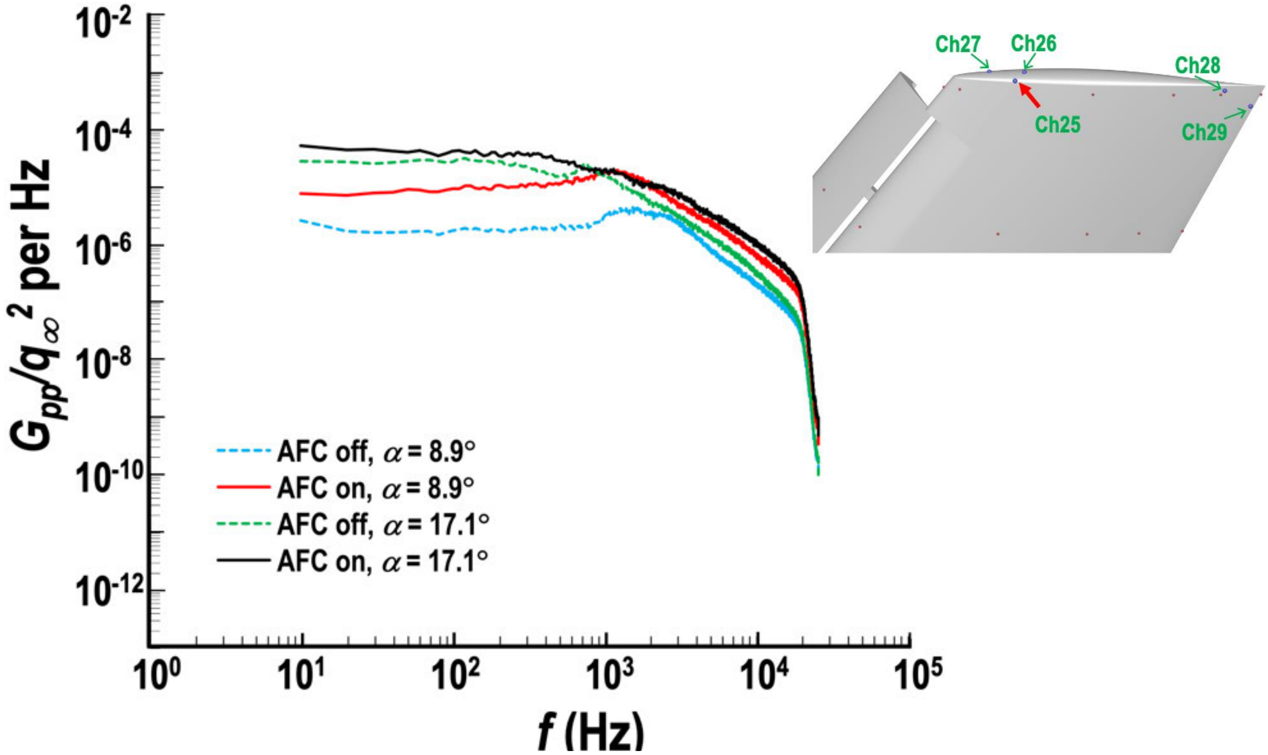


(a) Channel 23

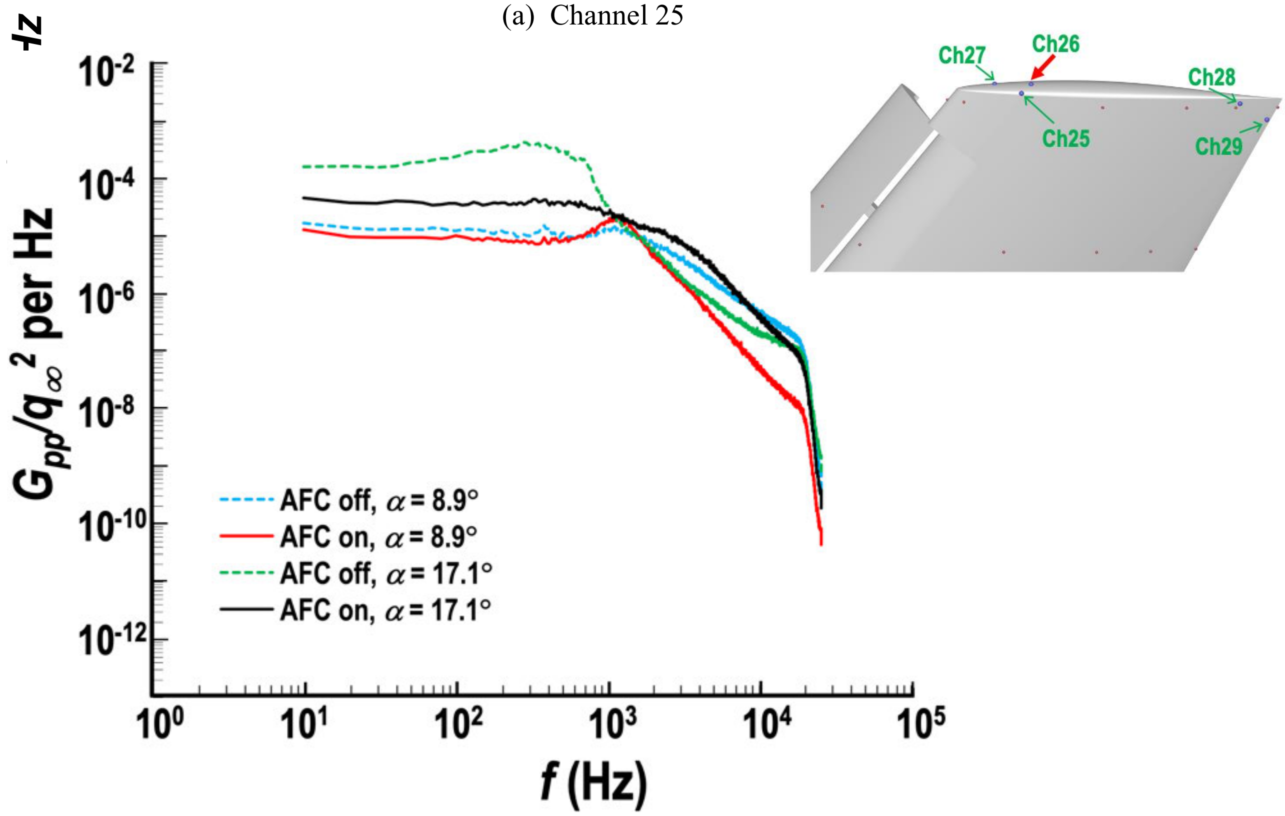


(b) Channel 24

Figure 80. Normalized autospectral density for Channels 23 and 24 on the pylon with and without the best-case HELP actuation at 8.9° and 17.1° angles of attack (M_∞ = 0.2, with TWICS).

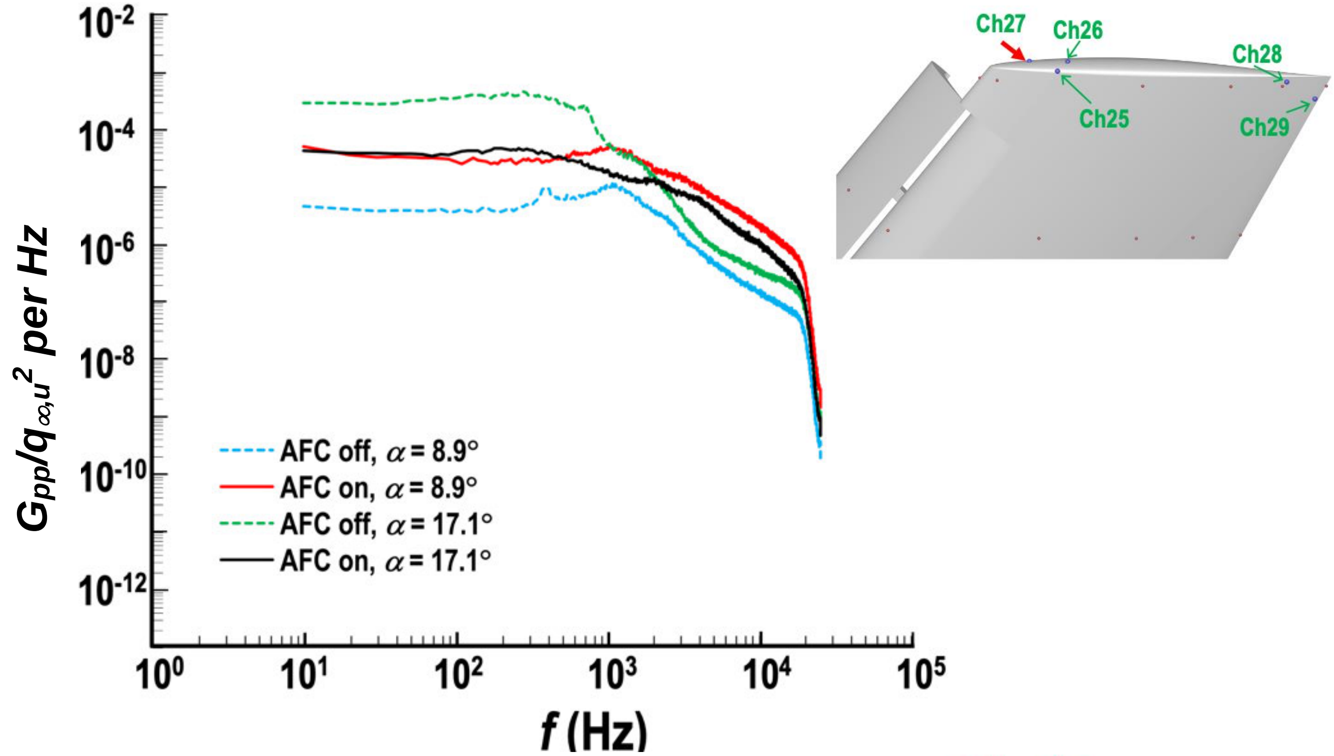


(a) Channel 25

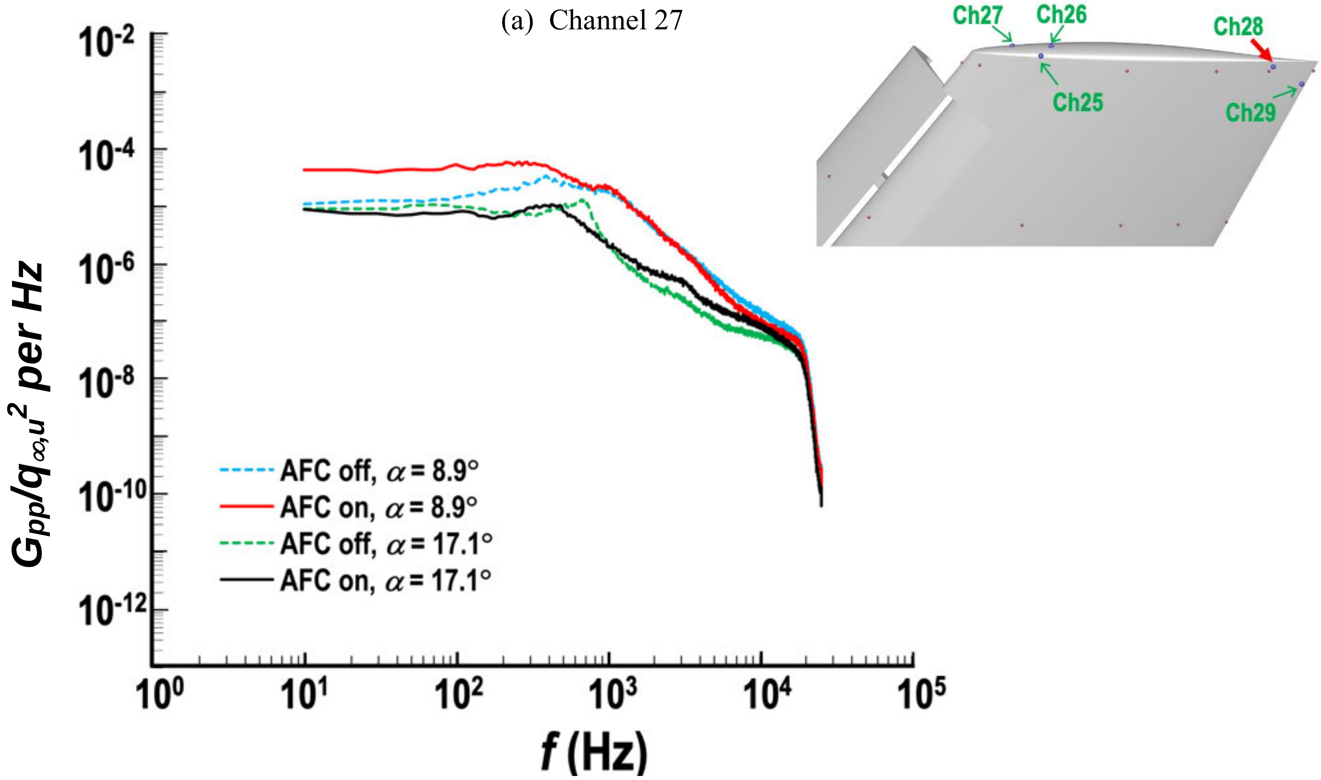


(b) Channel 26

Figure 81. Normalized autospectral density for Channels 25 and 26 on the wingtip with and without the best-case HELP actuation at 8.9° and 17.1° angles of attack (M_∞ = 0.2, with TWICS).



(a) Channel 27



(b) Channel 28

Figure 82. Normalized autospectral density for Channels 27 and 28 on the wingtip with and without the best-case HELP actuation at 8.9° and 17.1° angles of attack (M_∞ = 0.2, with TWICS).

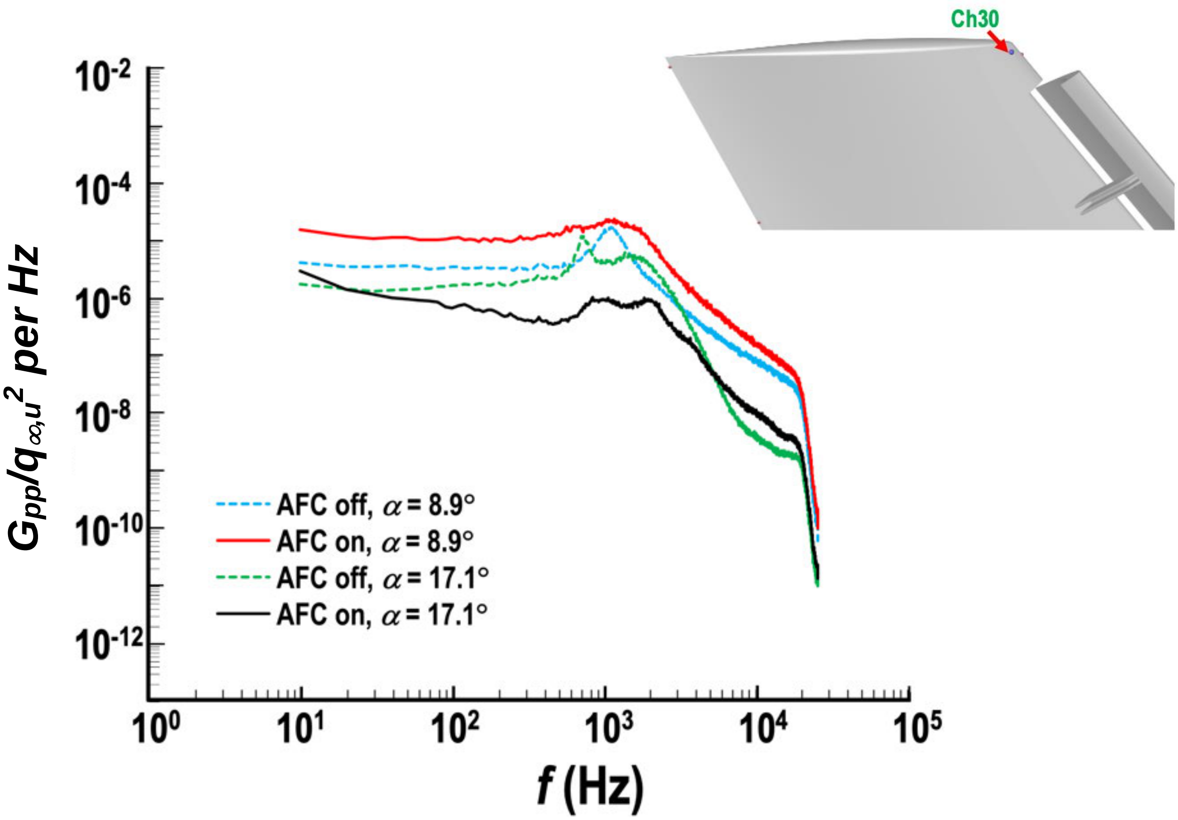


Figure 83. Normalized autospectral density for Channel 30 on the wingtip with and without the best-case HELP actuation at 8.9° and 17.1° angles of attack (M_∞ = 0.2, with TWICS).

Appendix A.

CRM-SHL-AFC Static Pressure Tap and Unsteady Pressure Transducer Coordinates

Table A1. CRM-SHL-AFC Pressure Tap Coordinates on High-Lift Wing (slat coordinates given in both stowed and deployed positions).

Location	Data file ID	Tap ID	Stowed Coordinates			Deployed Coordinates		
			x (inches)	*y* (inches)	*z* (inches)	*x* (inches)	*y* (inches)	*z* (inches)
ME	CPP0242	4	121.1577	12.3000	18.0072	Same as stowed coordinates		
ME		5**	100.7010	12.3160	18.6670			
ME		6**	99.3644	12.2990	17.5283			
Slat	CPP1041	7	106.1466	17.4501	19.4456	104.4566	18.8128	17.7752
Slat	CPP1021	8	105.6767	17.4499	19.3655	104.0608	18.7783	17.5117
Slat	CPP1034	9	105.1115	17.4496	19.2469	103.5937	18.7302	17.1756
Slat	CPP1019	10	104.4494	17.4499	19.0514	103.0692	18.6577	16.7326
Slat	CPP1011	11	103.9636	17.4495	18.8469	102.7088	18.5858	16.3548
Slat	CPP1039	12	103.6373	17.4501	18.6434	102.4933	18.5187	16.0434
Slat	CPP1023	13	103.4423	17.4488	18.4472	102.3942	18.4549	15.7932
Slat	CPP1035	14	103.3600	17.4497	18.3169	102.3715	18.4152	15.6460
Slat	CPP1013	15	103.3136	17.4515	18.2014	102.3757	18.3816	15.5262
Slat	CPP1030	16	103.2882	17.4513	18.0483	102.4139	18.3354	15.3830
Slat	CPP1012	17	103.3471	17.4505	17.8374	102.5519	18.2734	15.2247
Slat	CPP0724	18	103.5230	17.4490	17.6458	102.7886	18.2190	15.1317
Slat	CPP0743	19	103.8121	17.4493	17.4196	103.1424	18.1586	15.0549
Slat	CPP0841	20	104.1182	17.4491	17.2210	103.5007	18.1063	15.0092
Slat	CPP0809	21	104.2682	17.4489	17.1311	103.6732	18.0828	14.9933
Slat		22‡	104.3101	17.4500	17.1440	103.7063	18.0886	15.0215
Slat	CPP0846	23	104.0707	17.4495	17.4630	103.3605	18.1775	15.1993
Slat	CPP0822	24	104.7970	17.4499	18.7138	103.5209	18.5653	16.5835
Slat	CPP0829	25	105.4736	17.4503	19.1400	103.9663	18.7073	17.2322
Slat	CPP1026	26	106.0820	17.4501	19.4365	104.4014	18.8086	17.7406
ME	CPP0243	31	135.8089	17.4429	17.2155	Same as stowed coordinates		
ME	CPP0244	32	132.3327	17.4499	17.7225			
ME	CPP0234	33	127.6833	17.4424	18.3212			
ME	CPP0221	34	123.9717	17.4494	18.7515			
ME	CPP0209	35	120.2496	17.4456	19.1343			
ME	CPP0217	36	116.5354	17.4487	19.4543			
ME	CPP0230	37	112.5771	17.4527	19.6756			
ME	CPP0205	38	110.4971	17.4492	19.7153			
ME	CPP0706	39	109.1857	17.4314	19.6900			
ME	CPP0543	40	108.2761	17.4353	19.6494			
ME	CPP0522	41	107.1059	17.4370	19.5589			
ME	CPP0709	42	106.0935	17.4310	19.3738			
ME	CPP0535	43	105.3730	17.4380	19.0598			
ME	CPP0519	44	104.8193	17.4347	18.6682			
ME	CPP0714	45	104.5030	17.4370	18.3309			
ME	CPP0555	46	104.395	17.756	17.474			
ME	CPP0836	47	104.4015	17.4600	17.0351			
ME	CPP0855	48*	105.8468	17.4545	16.3770			
ME	CPP0851	49	108.175	17.448	15.59			
ME	CPP2002	50	114.2195	17.4329	14.2075			
ME	CPP2015	51	120.2565	17.4324	13.6174			
ME	CPP2003	52*	126.2907	17.4252	13.6838			

* Bad pressure ports due to leakage or blockage.
** Exist only on the non-strake piece and not on the strake piece being tested.
‡ Not available.

Table A1. Continued.

Location	Data file ID	Tap ID	Stowed Coordinates			Deployed Coordinates		
			x (inches)	*y* (inches)	*z* (inches)	*x* (inches)	*y* (inches)	*x* (inches)
ME	CPP0606	53	132.3338	17.4514	14.1352	Same as stowed coordinates		
Slat	CPP0723	81	108.3778	22.5990	19.4835	107.0044	23.7894	17.2921
ME	CPP0232	83	126.3502	22.5966	19.5109	Same as stowed coordinates		
ME	CPP0542	84	109.2145	22.5831	19.4369			
Slat	CPP0745	87	113.9890	27.7500	20.2466	112.3393	29.0586	18.8330
Slat	CPP0750	88	113.5218	27.7499	20.1750	111.9426	29.0268	18.5781
Slat	CPP0733	89	112.9594	27.7501	20.0724	111.4716	28.9840	18.2568
Slat	CPP0722	90	112.3032	27.7499	19.9121	110.9384	28.9216	17.8469
Slat	CPP0758	91	111.8199	27.7491	19.7459	110.5648	28.8608	17.5034
Slat	CPP0760	92	111.4971	27.7490	19.5802	110.3373	28.8043	17.2265
Slat	CPP0747	93	111.2990	27.7503	19.4238	110.2197	28.7547	17.0088
Slat	CPP0739	94	111.2167	27.7514	19.3193	110.1867	28.7229	16.8839
Slat	CPP0757	95	111.1711	27.7521	19.2323	110.1801	28.6967	16.7894
Slat	CPP0749	96	111.1469	27.7520	19.1533	110.1897	28.6726	16.7110
Slat	CPP0902	97	111.2018	27.7510	18.8965	110.3424	28.5967	16.5113
Slat	CPP0752	98	111.3614	27.7500	18.7650	110.5403	28.5603	16.4635
Slat	CPP0756	99	111.6266	27.7489	18.6187	110.8402	28.5217	16.4465
Slat	CPP0808	100	111.9781	27.7489	18.4535	111.2264	28.4805	16.4485
Slat	CPP0804	101	112.1288	27.7482	18.3916	111.3884	28.4648	16.4572
Slat	CPP0802	102	111.9355	27.7459	18.6600	111.1046	28.5380	16.6107
Slat	CPP0845	103	112.1648	27.7492	19.2250	111.0875	28.7139	17.1943
Slat	CPP0850	104	112.6483	27.7497	19.5964	111.3790	28.8354	17.7158
Slat	CPP0824	105	113.3215	27.7495	19.9609	111.8459	28.9584	18.3099
Slat	CPP0840	106	113.9269	27.7499	20.1754	112.3112	29.0360	18.7457
ME	CPP0248	111	138.7354	27.7386	19.0900	Same as stowed coordinates		
ME	CPP0226	112	135.7859	27.7409	19.4732			
ME	CPP0213	113	131.8643	27.7508	19.8995			
ME	CPP0229	114	128.7225	27.7454	20.1795			
ME	CPP0201	115	125.5913	27.7445	20.3993			
ME	CPP0202	116	122.4606	27.7514	20.5341			
ME	CPP0218	117	119.1293	27.7487	20.5574			
ME	CPP0237	118	117.3648	27.7501	20.5185			
ME	CPP0541	119	116.2743	27.7257	20.4614			
ME	CPP0562	120	115.4816	27.7334	20.4032			
ME	CPP0704	121	114.5075	27.7293	20.3053			
ME	CPP0708	122	113.6448	27.7262	20.0804			
ME	CPP0561	123	113.0469	27.7356	19.7978			
ME	CPP0559	124	112.5792	27.7329	19.4935			
ME	CPP0524	125	112.2997	27.7312	19.2395			
ME	CPP0558	126	112.05	27.78	18.679			
ME	CPP0839	127	112.2339	27.7499	18.3494			
ME	CPP0848	128	113.4499	27.7491	17.9432			
ME	CPP0828	129	115.4090	27.7494	17.4252			
ME	CPP2004	130	120.5032	27.7370	16.5098			
ME	CPP2001	131	125.5975	27.7296	16.1241			

Table A1. Continued.

Location	Data file ID	Tap ID	Stowed Coordinates			Deployed Coordinates		
			x (inches)	y (inches)	z (inches)	x (inches)	y (inches)	z (inches)
ME	CPP2018	132	130.6942	27.7335	16.1732	Same as stowed coordinates		
ME	CPP2016	133	135.7838	27.7429	16.5541			
Slat	CPP0742	161	116.2198	32.8991	20.3327	114.8674	34.0497	18.3916
ME	CPP0247	163	131.1120	32.8987	20.8009	Same as stowed coordinates		
ME	CPP0507	164*	116.8723	32.9378	20.1371			
ME	CPP0240	171	141.4753	38.0452	20.6985			
ME	CPP0211	172	139.0007	38.0424	20.9484			
ME	CPP0204	173	135.7127	38.0463	21.1981			
ME	CPP0225	174	133.0680	38.0501	21.3359			
ME	CPP0216	175	130.4219	38.0499	21.4058			
ME	CPP0223	176	127.7850	38.0424	21.4006			
ME	CPP0214	177	124.9740	38.0468	21.3125			
ME	CPP0527	178	123.4741	38.0294	21.2044			
ME	CPP0711	179	122.7050	38.0296	21.1359			
ME	CPP0727	180	122.5663	38.0287	21.1225			
ME	CPP0763	181	121.0922	38.0504	20.9428			
ME	CPP0735	182	120.3630	38.0494	20.8123			
ME	CPP0744	183	119.8543	38.0501	20.6758			
ME	CPP0753	184	119.4490	38.0495	20.5415			
ME	CPP0755	185	119.0685	38.0611	20.2629			
ME	CPP0734	186	118.9798	38.0570	20.0408			
Slat	CPP0737	209	124.0416	43.1718	21.1436	122.7273	44.3047	19.3666
ME	CPP0235	211	135.9558	43.1992	21.8343	Same as stowed coordinates		
ME	CPP0556	212	124.5433	43.1736	20.9104			
ME	CPP0751	213	123.7028	43.1674	20.2161			
Slat	CPP0759	216	129.5677	48.3245	21.8186	128.0179	49.5755	20.6977
Slat	CPP0754	217	129.1164	48.3238	21.7540	127.6310	49.5420	20.4589
Slat	CPP0761	218	128.5685	48.3230	21.6631	127.1663	49.4976	20.1580
Slat	CPP0748	219	127.9363	48.3195	21.5312	126.6405	49.4357	19.7882
Slat	CPP0740	220	127.5154	48.3360	21.4741	126.2801	49.4217	19.5632
Slat	CPP0729	221	127.1549	48.3324	21.2629	126.0337	49.3434	19.2349
Slat	CPP0730	222*	126.9669	48.3263	21.1396	125.9100	49.2945	19.0536
Slat	CPP0725	223	126.8901	48.3284	21.0574	125.8725	49.2692	18.9506
Slat	CPP0732	224	126.8504	48.3207	21.0042	125.8565	49.2445	18.8906
Slat	CPP0738	225	126.8215	48.3215	20.9198	125.8635	49.2186	18.8055
Slat	CPP0731	226	126.8851	48.3267	20.7392	125.9934	49.1703	18.6733
Slat	CPP0728	227	127.0166	48.3160	20.6504	126.1475	49.1368	18.6528
Slat	CPP0827	228	127.3030	48.3135	20.5350	126.4544	49.1075	18.6697
Slat	CPP0820	229	127.6537	48.3204	20.4340	126.8153	49.0934	18.7224
Slat	CPP0852	230	127.8010	48.3213	20.3973	126.9644	49.0873	18.7501
Slat	CPP0835	231	127.6459	48.2775	20.5016	126.7773	49.0730	18.7903
Slat	CPP0834	232	127.7975	48.3274	20.9939	126.7264	49.2752	19.2640
Slat	CPP0856	233	128.2537	48.3359	21.2661	127.0366	49.3796	19.6825
Slat	CPP0801	234	128.9083	48.3289	21.5675	127.5150	49.4839	20.2113
Slat	CPP0819	235	129.4941	48.3269	21.7591	127.9744	49.5575	20.6156

* Bad pressure ports due to leakage or blockage.

Table A1. Continued.

Location	Data file ID	Tap ID	Stowed Coordinates x (inches)	Stowed Coordinates y (inches)	Stowed Coordinates z (inches)	Deployed Coordinates x (inches)	Deployed Coordinates y (inches)	Deployed Coordinates z (inches)
ME	CPP0246	241	144.2166	48.3494	22.0968	Same as stowed coordinates		
ME	CPP0206	242	141.4721	48.2769	22.2859			
ME	CPP0220	243	139.2558	48.2922	22.3416			
ME	CPP0208	244	137.0691	48.3089	22.3431			
ME	CPP0210	245	134.8917	48.2994	22.2855			
ME	CPP0222	246	132.6360	48.3494	22.1132			
ME	CPP0551	247	131.3865	48.3202	22.0091			
ME	CPP0719	248	130.6416	48.3337	21.9391			
ME	CPP0718	249	130.1001	48.3270	21.8780			
ME	CPP0533	250	129.4269	48.3229	21.7242			
ME	CPP0526	251	128.8199	48.3385	21.4928			
ME	CPP0523	252	128.3971	48.3221	21.2912			
ME	CPP0717	253	128.0658	48.3321	21.0855			
ME	CPP0538	254	127.8656	48.3044	20.9365			
ME	CPP0547	255	127.4362	48.0029	20.5251			
ME	CPP0701	256	127.9747	48.5473	20.4258			
ME	CPP0812	257	128.6788	48.3502	20.2254			
ME	CPP0803	258	130.0416	48.3502	20.0168			
ME	CPP2013	259	133.5746	48.3393	19.6633			
ME	CPP2009	260	137.1158	48.3509	19.5305			
ME	CPP2012	261	140.6612	48.3384	19.6208			
ME	CPP2017	262	144.2137	48.3346	19.9522			
Slat	CPP0741	290	131.7855	53.4487	21.9138	130.5122	54.5462	20.1924
ME	CPP0228	292	142.6726	53.4675	22.7449	Same as stowed coordinates		
ME	CPP0549	293	132.2691	53.4822	21.6752			
Slat	CPP0726	296	135.7292	58.6238	22.3113	134.4689	59.7077	20.6346
ME	CPP0231	298	146.0147	58.6279	23.1724	Same as stowed coordinates		
ME	CPP0560	299	136.1474	58.6516	22.0641			
Slat	CPP1028	302	141.1719	63.7823	22.9882	139.6832	64.9822	21.9318
Slat	CPP1048	303	140.7463	63.7712	22.9228	139.3191	64.9393	21.7057
Slat	CPP1049	304	140.2318	63.7750	22.8322	138.8852	64.9004	21.4173
Slat	CPP1045	305	139.6326	63.7743	22.7015	138.3893	64.8424	21.0611
Slat	CPP1015	306	139.1901	63.7712	22.5727	138.0356	64.7873	20.7709
Slat	CPP0915	307	138.8944	63.7746	22.4477	137.8151	64.7438	20.5416
Slat	CPP0913	308	138.7086	63.7710	22.3323	137.6905	64.6998	20.3673
Slat	CPP0914	309	138.6334	63.7789	22.2516	137.6545	64.6805	20.2645
Slat	CPP0917	310	138.5907	63.7749	22.1891	137.6397	64.6564	20.1942
Slat	CPP0910	311	138.5718	63.7769	22.1127	137.6528	64.6344	20.1197
Slat	CPP0746	312	138.6248	63.7742	21.9643	137.7595	64.5881	20.0134
Slat	CPP0806	313	138.7319	63.7650	21.8941	137.8841	64.5610	19.9987
Slat	CPP0863	314	139.0235	63.7861	21.7887	138.1942	64.5574	20.0195
Slat	CPP0817	315	139.3695	63.7790	21.6988	138.5451	64.5332	20.0840
Slat	CPP0813	316	139.5151	63.7862	21.6700	138.6902	64.5355	20.1160
Slat	CPP0821	317	139.3306	63.7121	21.9012	138.4231	64.5302	20.2631
Slat	CPP0823	318	139.5094	63.7851	22.2034	138.4744	64.6971	20.5763

Table A1. Continued.

Location	Data file ID	Tap ID	Stowed Coordinates			Deployed Coordinates		
			x (inches)	*y* (inches)	*z* (inches)	*x* (inches)	*y* (inches)	*z* (inches)
Slat	CPP0857	319	139.9431	63.7873	22.4636	138.7681	64.7912	20.9772
Slat	CPP0825	320	140.5641	63.7770	22.7472	139.2225	64.8860	21.4779
Slat	CPP0844	321	141.1139	63.7881	22.9272	139.6549	64.9674	21.8537
ME	CPP0207	327	153.5897	63.7978	23.5213	Same as stowed coordinates		
ME	CPP0236	328	151.2492	63.7152	23.6300			
ME	CPP0212	329	149.3142	63.7535	23.6267			
ME	CPP0203	330	147.4501	63.7432	23.5740			
ME	CPP0227	331	145.6085	63.7873	23.4202			
ME	CPP0521	332	143.6231	63.7742	23.2652			
ME	CPP0548	333*	142.5804	63.7804	23.1556			
ME	CPP0545	334	141.9395	63.7763	23.0815			
ME	CPP0516	335	141.4642	63.7786	23.0047			
ME	CPP0513	336	140.8890	63.7639	22.8384			
ME	CPP0506	337	140.3786	63.7758	22.6289			
ME	CPP0501	338	140.0144	63.7721	22.4476			
ME	CPP0517	339	139.7344	63.7744	22.2707			
ME	CPP0546	340	139.5568	63.7798	22.1169			
ME	CPP0515	341	139.3994	63.7805	21.8407			
ME	CPP0544	342	139.5065	63.7895	21.6860			
ME	CPP0861	343	140.2517	63.8021	21.5496			
ME	CPP0842	344	141.4256	63.7969	21.4361			
ME	CPP2006	345	144.4547	63.7977	21.2487			
ME	CPP2005	346	147.5049	63.7936	21.2273			
ME	CPP2008	347	150.5351	63.7970	21.3749			
ME	CPP2007	348	153.5815	63.7912	21.7037			
Slat	CPP1022	376	143.5401	68.9139	23.0943	142.3113	69.9677	21.4948
ME	CPP0238	378	152.7118	68.8859	24.0010	Same as stowed coordinates		
ME	CPP0510	379	143.8765	68.9295	22.8274			
Slat	CPP1042	382	147.4370	74.0713	23.4892	146.2246	75.1102	21.9208
ME	CPP0241	384	156.0772	74.0804	24.3088	Same as stowed coordinates		
ME	CPP0710	385	147.7512	74.0670	23.2271			
Slat	CPP1038	388	152.7944	79.2364	24.1541	151.3663	80.3848	23.1712
Slat	CPP1025	389	152.3908	79.2231	24.0907	151.0213	80.3411	22.9563
Slat	CPP1009	390	151.9042	79.2276	24.0028	150.6119	80.3044	22.6814
Slat	CPP1010	391	151.3325	79.2223	23.8778	150.1384	80.2446	22.3427
Slat	CPP1014	392	150.9029	79.2275	23.7526	149.7959	80.1989	22.0584
Slat	CPP0904	393	150.6249	79.2300	23.6398	149.5867	80.1588	21.8471
Slat	CPP0909	394	150.4424	79.2184	23.5382	149.4589	80.1114	21.6884
Slat	CPP0903	395	150.3774	79.2189	23.4662	149.4280	80.0881	21.5995
Slat	CPP0912	396	150.3433	79.2223	23.4020	149.4225	80.0707	21.5290
Slat	CPP0916	397	150.3258	79.2219	23.3090	149.4432	80.0414	21.4414
Slat	CPP0907	398	150.3871	79.2228	23.2163	149.5358	80.0158	21.3857
Slat	CPP1043	399	150.4847	79.2236	23.1474	149.6522	79.9983	21.3653
Slat	CPP1032	400	150.7791	79.2155	23.0418	149.9621	79.9669	21.3956
Slat	CPP0805	401	151.0882	79.2212	22.9744	150.2716	79.9607	21.4609

* Bad pressure ports due to leakage or blockage.

Table A1. Continued.

Location	Data file ID	Tap ID	Stowed Coordinates x (inches)	Stowed Coordinates y (inches)	Stowed Coordinates z (inches)	Deployed Coordinates x (inches)	Deployed Coordinates y (inches)	Deployed Coordinates z (inches)
Slat	CPP0862	402	151.2336	79.2353	22.9531	150.4142	79.9719	21.4974
Slat	CPP0628	403	151.0264	79.2078	23.2186	150.1175	80.0207	21.6514
Slat	CPP0847	404	151.2029	79.229	23.4117	150.2046	80.105	21.8842
Slat	CPP0810	405	151.6297	79.2374	23.6656	150.4951	80.2028	22.275
Slat	CPP0837	406	152.2081	79.2369	23.9215	150.9225	80.2973	22.7316
Slat	CPP0816	407	152.741	79.2279	24.0978	151.3389	80.358	23.1032
ME	CPP0219	413	162.9655	79.2442	24.6652	Same as stowed coordinates		
ME	CPP0224	414	161.0087	79.2455	24.6857			
ME	CPP0239	415	159.4537	79.2425	24.6648			
ME	CPP0215	416	157.8817	79.2479	24.612			
ME	CPP0245	417	156.3218	79.2394	24.5215			
ME	CPP0530	418	154.6409	79.2294	24.3753			
ME	CPP0502	419	153.7753	79.2203	24.2791			
ME	CPP0505	420	153.245	79.2192	24.208			
ME	CPP0540	421	152.8552	79.2216	24.1193			
ME	CPP0557	422*	152.363	79.2271	23.9543			
ME	CPP0525	423	151.9356	79.2147	23.7761			
ME	CPP0528	424	151.6337	79.224	23.6178			
ME	CPP0702	425	151.3985	79.22	23.4671			
ME	CPP0503	426	151.2552	79.2274	23.3406			
ME	CPP0553	427	151.1209	79.2326	23.1096			
ME	CPP0705	428	151.207	79.2493	22.9806			
ME	CPP0843	429	151.8329	79.2492	22.8655			
ME	CPP0858	430	152.8105	79.2491	22.7805			
ME	CPP0838	431	155.35	79.2492	22.6863			
ME	CPP2010	432	157.8773	79.2404	22.7379			
ME	CPP2011	433	160.4079	79.2442	22.8931			
ME	CPP2014	434	162.9619	79.2396	23.1782			
Slat	CPP1020	462	155.2349	84.3781	24.278	154.0545	85.3874	22.776
ME	CPP0322	463	172.675	84.3728	24.3149	Same as stowed coordinates		
ME	CPP0443	464	170.3531	84.4155	24.7281			
ME	CPP0437	465	167.5768	84.4093	24.9685			
ME	CPP0233	466	162.8903	84.3978	25.0229			
ME	CPP0508	467	155.5809	84.3789	24.0433			
Slat	CPP1002	468	159.1443	89.5195	24.6814	157.9742	90.5176	23.2191
ME	CPP0351	469	175.3344	89.5585	24.7541	Same as stowed coordinates		
ME	CPP0627	470	173.1724	89.5407	25.1322			
ME	CPP0426	471	170.6093	89.5366	25.351			
ME	CPP0447	472	166.24	89.5349	25.382			
ME	CPP0537	473	159.4519	89.5272	24.4449			
Slat	CPP1016	474	164.4355	94.6716	25.335	163.0586	95.7745	24.4366
Slat	CPP1037	475	164.0416	94.6722	25.2734	162.7231	95.7449	24.2232
Slat	CPP1027	476	163.5678	94.6721	25.191	162.3228	95.7059	23.9596
Slat	CPP1008	477	163.0405	94.6716	25.08	161.8848	95.6562	23.6496

* Bad pressure ports due to leakage or blockage.

Table A1. Continued.

Location	Data file ID	Tap ID	Stowed Coordinates			Deployed Coordinates		
			x (inches)	*y* (inches)	*z* (inches)	*x* (inches)	*y* (inches)	*z* (inches)
Slat	CPP1046	478	162.6427	94.6694	24.9721	161.5638	95.6097	23.3953
Slat	CPP1024	479	162.3738	94.6668	24.8720	161.3574	95.5688	23.2002
Slat	CPP0911	480	162.2144	94.6730	24.7829	161.2475	95.5429	23.0565
Slat	CPP0905	481	162.1442	94.6733	24.7222	161.2074	95.5226	22.9754
Slat	CPP0906	482	162.1056	94.6706	24.6729	161.1913	95.5039	22.9178
Slat	CPP0908	483	162.0861	94.6745	24.6025	161.2017	95.4855	22.8477
Slat	CPP0736	484	162.1383	94.6752	24.4999	161.2899	95.4564	22.7798
Slat	CPP1029	485	162.2505	94.6872	24.4481	161.4140	95.4553	22.7769
Slat	CPP1040	486	162.5228	94.6722	24.3597	161.6962	95.4219	22.8151
Slat	CPP0807	487	162.8276	94.6790	24.3045	161.9971	95.4204	22.8890
Slat	CPP0831	488	162.9290	94.6772	24.2901	162.0952	95.4172	22.9181
Slat	CPP0814	489	162.7436	94.6505	24.5204	161.8323	95.4567	23.0503
Slat	CPP0832	490	162.9181	94.6814	24.6827	161.9308	95.5407	23.2528
Slat	CPP0811	491	163.3195	94.6856	24.9045	162.2104	95.6241	23.6066
Slat	CPP0629	492	163.8751	94.6886	25.1283	162.6299	95.7113	24.0251
Slat	CPP0818	493	164.3665	94.6868	25.2801	163.0187	95.7702	24.3566
ME	CPP0355	494*	177.9936	94.7057	25.1968	Same as stowed coordinates		
ME	CPP0321	495	177.3752	94.6789	25.3558			
ME	CPP0363	496	176.7309	94.6987	25.4557			
ME	CPP0318	497	175.9918	94.6869	25.5373			
ME	CPP0446	498	174.8445	94.6880	25.6479			
ME	CPP0405	499	173.6288	94.6843	25.7358			
ME	CPP0422	500	172.4390	94.6896	25.7801			
ME	CPP0421	501	170.8569	94.6943	25.7838			
ME	CPP0442	502	169.5783	94.6925	25.7519			
ME	CPP0438	503	168.3155	94.6859	25.6930			
ME	CPP0439	504	167.0549	94.6899	25.6082			
ME	CPP0529	505	166.1299	94.6842	25.5311			
ME	CPP0504	506	165.3148	94.6845	25.4421			
ME	CPP0536	507	164.8058	94.6811	25.3730			
ME	CPP0712	508	164.4573	94.6849	25.2902			
ME	CPP0511	509*	163.9924	94.6765	25.1418			
ME	CPP0509	510	163.5922	94.6743	24.9837			
ME	CPP0520	511	163.2992	94.6840	24.8393			
ME	CPP0518	512	163.0999	94.6719	24.7251			
ME	CPP0539	513	162.7174	94.3838	24.5729			
ME	CPP0720	514	162.7544	94.5815	24.3898			
ME	CPP0721	515	162.0863	94.6710	24.6295			
ME	CPP0849	516	163.5058	94.6979	24.2257			
ME	CPP0853	517	164.4177	94.6988	24.1652			
ME	CPP0833	518	166.2855	94.6883	24.1386			
ME	CPP0325	519	168.3277	94.6993	24.1934			
ME	CPP0330	520	170.3894	94.6977	24.3639			
ME	CPP0344	521	171.2581	94.6987	24.4666			
ME	CPP0315	522	172.4486	94.6988	24.6346			

* Bad pressure ports due to leakage or blockage.

Table A1. Continued.

Location	Data file ID	Tap ID	Stowed Coordinates x (inches)	Stowed Coordinates y (inches)	Stowed Coordinates z (inches)	Deployed Coordinates x (inches)	Deployed Coordinates y (inches)	Deployed Coordinates z (inches)
ME	CPP0334	523	175.6183	94.6989	25.1482	Same as stowed coordinates		
ME	CPP0360	524	176.6483	94.7010	25.2599			
ME	CPP0311	525	177.2670	94.7362	25.2962			
ME	CPP0310	526	177.7526	94.6925	25.2530			
Slat	CPP1033	527	166.9489	99.8187	25.4750	165.8076	100.7893	24.0834
ME	CPP0304	528*	180.6573	99.8640	25.6364	Same as stowed coordinates		
ME	CPP0320	529	178.8220	99.8405	25.9414			
ME	CPP0425	530	176.6507	99.8373	26.1217			
ME	CPP0419	531	172.9343	99.8463	26.1309			
ME	CPP0715	532	167.1695	99.8342	25.2378			
Slat	CPP1050	533	172.1826	104.9702	26.1334	170.8375	106.0454	25.2818
Slat	CPP1001	534	171.8118	104.9689	26.0722	170.5228	106.0147	25.0787
Slat	CPP1047	535	171.3631	104.9747	25.9889	170.1463	105.9818	24.8228
Slat	CPP1031	536	170.8538	104.9698	25.8801	169.7235	105.9292	24.5233
Slat	CPP1018	537	170.4587	104.9730	25.7749	169.4044	105.8886	24.2709
Slat	CPP1017	538	170.1999	104.9809	25.6801	169.2061	105.8597	24.0815
Slat	CPP1036	539	170.0418	104.9792	25.6056	169.0909	105.8308	23.9532
Slat	CPP1003	540	169.9725	104.9696	25.5562	169.0462	105.8045	23.8851
Slat	CPP1004	541	169.9431	104.9741	25.5165	169.0354	105.7959	23.8375
Slat	CPP1007	542	169.9232	104.9784	25.4247	169.0539	105.7713	23.7486
Slat	CPP0762	543	169.9606	104.9657	25.3723	169.1075	105.7443	23.7220
Slat	CPP1005	544	170.1016	104.9698	25.3117	169.2606	105.7338	23.7255
Slat	CPP1044	545	170.3441	104.9758	25.2508	169.5067	105.7280	23.7694
Slat	CPP0815	546	171.1110	104.9850	25.7350	170.0172	105.9068	24.4975
Slat	CPP0826	547	171.6404	104.9866	25.9323	170.4231	105.9839	24.8828
Slat	CPP0859	548	172.1175	104.9818	26.0745	170.8024	106.0366	25.2010
ME	CPP0331	549*	183.3129	105.0082	26.0920	Same as stowed coordinates		
ME	CPP0319	550	182.7855	104.9830	26.2067			
ME	CPP0312	551	182.2353	104.9784	26.2783			
ME	CPP0313	552	181.6461	104.9945	26.3446			
ME	CPP0349	553	180.6385	105.0233	26.4383			
ME	CPP0445	554	179.6669	104.9966	26.5002			
ME	CPP0429	555	178.6676	104.9921	26.5386			
ME	CPP0415	556	177.3542	104.9889	26.5404			
ME	CPP0434	557	176.2856	104.9910	26.5030			
ME	CPP0417	558	175.2337	104.9982	26.4421			
ME	CPP0707	559	174.1616	104.9845	26.3523			
ME	CPP0554	560	173.4032	104.9841	26.2724			
ME	CPP0563	561	172.7200	104.9825	26.1877			
ME	CPP0703	562	172.2962	104.9927	26.0987			
ME	CPP0713	563	172.0039	104.9829	26.0159			
ME	CPP0532	564	171.6066	104.9749	25.8827			
ME	CPP0550	565	171.2812	104.9737	25.7564			
ME	CPP0531	566	171.0426	104.9769	25.6455			
ME	CPP0512	567	170.8574	104.9801	25.5349			

* Bad pressure ports due to leakage or blockage.

Table A1. Concluded.

Location	Data file ID	Tap ID	Stowed Coordinates			Deployed Coordinates		
			x (inches)	*y* (inches)	*z* (inches)	*x* (inches)	*y* (inches)	*z* (inches)
ME	CPP0534	568	170.7438	104.9833	25.4467	Same as stowed coordinates		
ME	CPP0552	569	170.6459	104.9847	25.2959			
		570	Not available					
ME	CPP0860	571	171.198	104.99	25.141			
ME	CPP0830	572	171.959	104.992	25.107			
ME	CPP0854	573	173.503	104.989	25.101			
ME	CPP0343	574	175.2267	104.9991	25.1910			
ME	CPP0324	575	176.9557	104.9853	25.3495			
ME	CPP0314	576	178.6687	104.9901	25.5909			
ME	CPP0326	577	179.8738	105.0215	25.8030			
ME	CPP0358	578	181.3111	105.0192	26.0214			
ME	CPP0352	579	182.1823	104.9894	26.1155			
ME	CPP0309	580	182.6602	104.9965	26.1354			
ME	CPP0361	581	183.0201	104.9839	26.1232			
Slat	CPP1006	582	174.7484	110.1282	26.2623	173.6397	111.0687	24.9371
ME	CPP0350	583	185.9568	110.1722	26.5816	Same as stowed coordinates		
ME	CPP0307	584	184.4675	110.1418	26.7329			
ME	CPP0435	585	182.6902	110.1466	26.8431			
ME	CPP0433	586	179.6336	110.1464	26.8337			
ME	CPP0716	587	174.8920	110.1194	26.0332			
ME	CPP0440	588*?	188.659	115.302	27.0463			
ME	CPP0441	589	187.281	115.299	27.076			
ME	CPP0424	590	185.664	115.298	27.107			
ME	CPP0444	591	182.887	115.299	27.062			
ME	CPP0436	592	178.322	115.301	26.537			
ME	CPP0901	593	177.778	115.296	26.307			

* Bad pressure ports due to leakage or blockage.

Table A2. CRM-SHL-AFC Pressure Tap Coordinates on Simple-Hinged Flaps in Deployed Position.

Data file ID	Tap ID	*x* (inches)	*y* (inches)	*z* (inches)
CPP0142	3001	143.6492	13.5786	9.5367
CPP0143	3002	141.0966	12.4310	14.0517
CPP0102	3003	140.2919	12.1538	15.0984
CPP0354	3004	144.2191	16.1508	10.1354
CPP0107	3005	141.5999	15.0075	14.5903
CPP0622	3006	144.7435	18.7013	10.6990
CPP0139	3007	144.6144	18.6416	10.9773
CPP0147	3008	144.3201	18.5106	11.5047
CPP0109	3009	144.0182	18.3758	12.0239
CPP0140	3010	143.5580	18.1831	12.7923
CPP0401	3011	143.1800	18.0182	13.3992
CPP0137	3012	142.6091	17.7886	14.3101
CPP0145	3013	142.0959	17.5821	15.1202
CPP0148	3014	142.0631	19.8807	16.3995
CPP0141	3015*	141.8066	19.8842	16.6677
CPP0136	3016	141.5671	19.8986	16.8263
CPP0163	3017	141.3271	19.9297	16.9300
CPP0101	3018	140.9655	19.9854	17.0115
CPP0138	3019*	139.6463	20.2043	17.2695
CPP0134	3020	138.3209	20.4257	17.5298
CPP0618	3021	141.0119	17.6141	14.4741
CPP0616	3022	141.8744	17.8486	13.6767
CPP0625	3023	142.7311	18.0795	12.8511
CPP0601	3024	143.5617	18.3194	12.0105
CPP0605	3025	144.1671	18.5192	11.3653
CPP0603	3026	145.2613	21.2680	11.2553
CPP0133	3027	142.5899	20.1505	15.6312
CPP0619	3028	145.7620	23.8255	11.7980
CPP0158	3029	143.0722	22.7367	16.1500
CPP0612	3030	146.2458	26.3729	12.3232
CPP0263	3031	143.5415	25.3104	16.6622
CPP0608	3032	146.7159	28.9927	12.8433
CPP0250	3033	146.5921	28.9334	13.1179
CPP0254	3034	146.2829	28.7992	13.6439
CPP0260	3035	145.9675	28.6574	14.1534
CPP0255	3036	145.4767	28.4697	14.9215
CPP0249	3037	145.0796	28.3128	15.5282
CPP0251	3038	144.4844	28.0786	16.4321
CPP0252	3039	143.9573	27.8765	17.2335
CPP0256	3040	143.2827	27.1102	17.9552
CPP0257	3041	143.0099	27.1157	18.1914
CPP0258	3042	142.7708	27.1395	18.3263
CPP0261	3043	142.5118	27.1682	18.4146
CPP0259	3044	142.1601	27.2244	18.4833
CPP0262	3045	140.9677	27.4280	18.7036
CPP0253	3046	139.7941	27.6017	18.9188
CPP0602	3047	142.9886	27.8822	16.7014
CPP0611	3048	143.8742	28.1227	15.8888
CPP0609	3049	144.7382	28.3606	15.0635
CPP0623	3050	145.5765	28.6104	14.2083
CPP0317	3051	146.1699	28.8007	13.5440
CPP0624	3052	147.1689	31.5711	13.3437
CPP0127	3053	144.4488	30.4682	17.6534
CPP0329	3054	147.5870	34.1309	13.8165
CPP0154	3055	144.8589	33.0356	18.1586
CPP0316	3056	148.0017	36.7229	14.2857
CPP0149	3057	145.2687	35.6219	18.6161
CPP0301	3058	148.3822	39.2943	14.7258
CPP0103	3059	148.2739	39.2399	15.0142
CPP0402	3060	147.9815	39.1137	15.5463
CPP0153	3061	147.6715	38.9925	16.0596
CPP0151	3062	147.1839	38.7898	16.8034
CPP0159	3063	146.7802	38.6285	17.4034
CPP0119	3064	146.1828	38.4013	18.2870
CPP0152	3065	145.6450	38.1926	19.0782
CPP0106	3066	144.5251	34.3589	19.2693
CPP0104	3067	144.2555	34.3669	19.5193
CPP0125	3068	144.0102	34.3869	19.6580
CPP0150	3069	143.7487	34.4249	19.7466
CPP0144	3070	143.3859	34.4848	19.8110
CPP0157	3071	142.3230	34.6679	19.9898
CPP0156	3072	141.2214	34.8488	20.1721
CPP0333	3073	144.6473	38.2100	18.5736
CPP0308	3074	145.5450	38.4457	17.7835
CPP0327	3075	146.4177	38.6886	16.9862
CPP0306	3076	147.2635	38.9296	16.1502
CPP0332	3077	147.8863	39.1288	15.4448
CPP0323	3078	148.7454	41.8778	15.1525
CPP0121	3079	146.0218	40.7781	19.5202
CPP0610	3080	149.4431	44.7569	15.7954
CPP0116	3081	146.6957	43.3161	19.8687
CPP0161	3082	145.6973	42.7328	20.8528
CPP0328	3083	150.8572	47.2639	16.1808
CPP0110	3084	148.0535	45.6774	20.1354
CPP0614	3085	152.3148	49.8199	16.5808
CPP0112	3086	152.1705	49.6655	16.8311
CPP0146	3087	151.8850	49.4721	17.3067
CPP0113	3088	151.5722	49.2907	17.7616
CPP0160	3089	151.0731	49.0187	18.4248
CPP0118	3090	150.6706	48.8168	18.9510

* Bad pressure ports due to leakage or blockage.

Table A2. Concluded.

Data file ID	Tap ID	x (inches)	y (inches)	z (inches)	Data file ID	Tap ID	x (inches)	y (inches)	z (inches)
CPP0129	3091	150.0612	48.5114	19.7394	CPP0162	3129	155.9901	63.0127	23.2436
CPP0117	3092	149.5226	48.2296	20.4236	CPP0345	3130	157.3920	63.9087	21.8026
CPP0122	3093	149.2504	48.0915	20.7750	CPP0302	3131	158.1831	64.1192	21.1950
CPP0123	3094	149.5610	49.4973	21.6065	CPP0620	3132	158.9612	64.3897	20.5969
CPP0132	3095	149.3897	49.5900	21.7400	CPP0337	3133	159.6732	64.5634	19.9102
CPP0130	3096	149.1951	49.6944	21.8388	CPP0347	3134	160.2055	64.7753	19.3405
CPP0124	3097	148.9247	49.8479	21.9003	CPP0341	3135	161.9721	67.5455	19.0937
CPP0114	3098	148.7514	49.9776	21.9432	CPP0108	3136	159.6386	66.2471	22.3402
CPP0120	3099	148.5916	50.0250	21.9691	CPP0346	3137	163.3284	70.0888	19.4356
CPP0613	3100	148.6164	48.5341	20.0563	CPP0131	3138	161.0577	68.8302	22.5772
CPP0615	3101	149.5081	48.7757	19.3526	CPP0342	3139	164.6906	72.6648	19.7740
CPP0621	3102	150.3775	49.0142	18.6241	CPP0432	3140	162.4794	71.4267	22.8153
CPP0607	3103	151.2029	49.2680	17.8560	CPP0359	3141	166.0136	75.1950	20.0994
CPP0626	3104	151.8068	49.5267	17.2344	CPP0456	3142	163.8862	74.0147	23.0652
CPP0604	3105	153.6950	52.3128	16.9494	CPP0305	3143	167.3787	77.7612	20.4411
CPP0115	3106	150.9885	50.7870	20.7225	CPP0452	3144	165.2958	76.6106	23.3155
CPP0617	3107	155.1020	54.8574	17.3238	CPP0335	3145	168.7213	80.3351	20.7701
CPP0128	3108	152.4562	53.3564	21.0099	CPP0459	3146	168.6376	80.2255	20.9706
CPP0303	3109	156.4909	57.3612	17.6913	CPP0455	3147	168.4419	80.0852	21.3044
CPP0126	3110	153.9060	55.9244	21.2980	CPP0403	3148	168.2158	79.9509	21.6338
CPP0336	3111	157.8837	59.9262	18.0520	CPP0423	3149	167.8609	79.7608	22.1017
CPP0105	3112	155.3515	58.4943	21.5649	CPP0460	3150	167.5562	79.6125	22.4949
CPP0339	3113	159.2449	62.4502	18.4015	CPP0448	3151	167.1113	79.3934	23.0494
CPP0414	3114	156.7923	61.0783	21.8251	CPP0453	3152	166.7167	79.2060	23.5439
CPP0340	3115	160.6227	64.9934	18.7562	CPP0450	3153	166.5142	79.1008	23.7867
CPP0409	3116	160.5168	64.8921	18.9864	CPP0457	3154	164.1913	75.5917	24.0243
CPP0155	3117	160.2698	64.7198	19.4014	CPP0458	3155	164.0642	75.6594	24.1200
CPP0111	3118	159.9940	64.5607	19.8002	CPP0449	3156	163.8889	75.7601	24.2025
CPP0408	3119	159.5529	64.3235	20.3818	CPP0454	3157	163.6964	75.8682	24.2422
CPP0406	3120	159.1987	64.1457	20.8364	CPP0404	3158	163.5433	75.9300	24.2601
CPP0416	3121	158.6587	63.8765	21.5245	CPP0428	3159	163.4391	75.9797	24.2788
CPP0412	3122	158.1832	63.6421	22.1278	CPP0348	3160	166.0735	79.4178	23.2532
CPP0413	3123	157.9407	63.5192	22.4327	CPP0338	3161	166.7078	79.5990	22.7801
CPP0420	3124	156.8648	62.5248	22.9575	CPP0356	3162	167.3424	79.7739	22.2696
CPP0407	3125	156.7202	62.6174	23.0613	CPP0353	3163	167.9431	79.9581	21.7247
CPP0418	3126	156.5531	62.7012	23.1306	CPP0362	3164	168.3853	80.1346	21.2522
CPP0410	3127	156.3159	62.8412	23.1861	CPP0357	3165	170.0526	82.8629	21.1008
CPP0411	3128	156.1229	62.9307	23.2190	CPP0451	3166	168.1171	81.7801	23.7792

Table A3. CRM-SHL-AFC Pressure Tap Coordinates on Fuselage.

Data file ID	Tap ID	x (inches)	y (inches)	z (inches)
CPP1935	801	23.6144	6.9834	25.6164
CPP1934	802	23.6159	7.7770	22.9953
CPP1936	803	23.6189	6.9686	16.4741
CPP1933	804*	44.5985	7.0039	31.8566
CPP1937	805	44.6054	11.9910	22.9942
CPP1928	806	44.5998	7.0011	12.1401
CPP1930	807	63.3022	7.0071	32.1335
CPP1931	808	63.3000	12.1679	23.0000
CPP1938	809	63.3005	7.0052	12.1141
CPP1940	810	93.0032	7.0088	32.1228
CPP1055	811	92.9894	12.2102	23.0116
CPP1929	812	92.9882	7.0034	10.4211
CPP1932	813	99.7004	7.0263	32.1395
CPP1054	814	99.6951	11.5956	26.0091
CPP1056	815	99.6928	12.1991	23.0029
CPP0462	816	99.6964	12.0998	19.9974
CPP1939	817	99.6809	11.0694	10.9564
CPP1927	818	99.6954	7.0003	9.2170
CPP1926	819	106.4071	7.0306	32.1432
CPP1061	820	106.4106	11.6076	26.0267
CPP1062	821	106.4049	12.2145	23.0223
CPP1063	822	106.3990	12.0770	19.9967
CPP1921	823	106.3602	11.8235	10.9009
CPP1923	824	106.3792	6.9844	9.0148
CPP1949	825	121.2476	7.0165	32.1451
CPP1057	826	121.2490	12.1873	23.0041
CPP1922	827	121.2418	6.9999	9.0264
CPP0461	828	132.4962	7.0140	32.1326
CPP1060	829	132.5017	11.5843	26.0144
CPP1059	830	132.4993	12.1749	23.0003
CPP1058	831	132.4972	12.0305	20.0004
CPP1920	832	132.4834	11.7928	10.9380

Data file ID	Tap ID	x (inches)	y (inches)	z (inches)
CPP1924	833	132.4825	6.9923	9.0288
CPP1902	834	142.4950	7.0051	32.1347
CPP1912	835	142.5000	11.5589	25.9981
CPP1052	836	142.5007	12.1556	22.9982
CPP1051	837	142.5014	11.9980	20.0016
CPP1916	838	142.5024	11.8456	17.9947
CPP1053	839	142.4857	11.4467	10.9334
CPP1925	840	142.4937	6.9568	9.0448
CPP1917	841	149.4970	7.0031	32.1127
CPP1906	842	149.4949	11.5737	26.0050
CPP1905	843	149.5028	12.1544	22.9972
CPP1904	844	149.5003	11.9997	20.0029
CPP1915	845	149.5044	11.9118	17.9962
CPP1908	846	149.5041	11.8693	14.0030
CPP1914	847	149.4997	10.5960	11.0105
CPP1909	848	149.5000	6.9863	9.2636
CPP1907	849	155.9282	6.9131	32.1536
CPP1913	850	155.9084	12.1436	22.9697
CPP1903	851*	155.9286	11.4584	18.0249
CPP1910	852	155.9422	11.1256	13.9812
CPP1911	853	156.5016	6.9910	10.0130
CPP1918	854	185.4998	6.9979	32.0818
CPP1919	855	185.5158	12.0956	22.9829
CPP1901	856	185.5005	7.0004	12.1435

* Bad pressure ports due to leakage or blockage.

Table A4. CRM-SHL-AFC Pressure Tap Coordinates on Nacelle/Pylon.

Data file ID	Tap ID	*x* (inches)	*y* (inches)	*z* (inches)
CPP1717	701	109.2734	36.9210	17.5800
CPP1719	702	109.2671	37.8850	18.4379
CPP1720	703	109.2055	39.1006	17.8244
CPP1744	704	99.9534	31.4993	11.8501
CPP1714	705	99.9631	32.8514	14.3588
CPP1733	706	99.9012	35.0511	16.1579
CPP1734	707	99.8458	37.7852	16.9982
CPP1743	708	99.7360	40.5749	16.7614
CPP1736	709	99.5987	43.1238	15.4704
CPP1737	710	99.4717	44.9971	13.3342
CPP1751	711†	106.8884	32.3704	8.9618
CPP1754	712†	106.9715	33.7346	13.7125
CPP1741	713†	106.6241	42.8616	14.7085
CPP1763	714†	106.4451	45.2210	10.3027
CPP1756	715†	106.3884	43.7071	5.6230
CPP1750	716†	106.5055	39.4364	3.3629
CPP1760	717†	106.6914	34.8013	4.7000
CPP1725	718	97.4939	31.9500	9.1497
CPP1715	719	97.6964	31.6932	9.1269
CPP1705	720	98.5318	31.4122	9.0710
CPP1732	721	99.9417	31.1652	9.0133
CPP1724	722	101.8312	30.9957	8.9291
CPP1757	723	104.0958	30.9181	8.8502
CPP1761	724	106.6374	30.9590	8.8040
CPP1758	725	109.2931	31.1362	8.7454
CPP1712	726	97.0143	37.8082	16.0370
CPP1710	727	97.3675	37.7705	16.3466
CPP1711	728	98.7128	37.7686	16.7713
CPP1742	729	100.7727	37.7991	17.1423
CPP1752	730	103.1242	37.8636	17.3843
CPP1735	731	97.0357	44.9569	10.5198
CPP1709	732	97.2278	45.2211	10.5467
CPP1730	733	98.0403	45.5616	10.5610
CPP1738	734	99.4264	45.9113	10.5600
CPP1722	735	101.2955	46.2214	10.5812
CPP1740	736	103.5440	46.4598	10.4934
CPP1755	737	106.0754	46.6071	10.4522
CPP1747	738	108.7654	46.6337	10.3785
CPP1728	739	97.5611	39.1967	2.9762
CPP1721	740	97.7371	39.2116	2.7314
CPP1723	741	98.5321	39.2798	2.4416
CPP1739	742	99.8713	39.3472	2.1898
CPP1716	743	101.6735	39.4327	1.9882
CPP1759	744	103.8265	39.4937	1.8570
CPP1748	745	106.2608	39.5999	1.8106
CPP1746	746	108.8149	39.6964	1.8561
CPP1708	747†	97.7527	32.3896	9.1906
CPP1706	748†	99.3125	32.7324	9.1873
CPP1729	749†	101.7329	32.6135	9.1164
CPP1762	750†	104.5514	32.4479	9.0263
CPP1701	751†	97.3242	37.8403	15.5212
CPP1703	752†	98.9930	37.9195	15.3924
CPP1707	753†	101.5170	37.9770	15.7413
CPP1753	754†	104.4984	38.0438	16.0299
CPP1727	755†	97.3150	44.5202	10.5118
CPP1702	756†	98.9055	44.2960	10.4291
CPP1731	757†	101.2798	44.5971	10.3774
CPP1745	758†	104.0827	44.9620	10.3524
CPP1704	759†	97.8222	39.1661	3.3871
CPP1713	760†	99.2508	39.1341	3.7841
CPP1726	761†	101.5151	39.2278	3.7860
CPP1749	762†	104.1611	39.3411	3.5706
CPP1718	763	103.2594	37.8437	17.4051

† Nacelle internal pressure ports.

Table A5. CRM-SHL-AFC Unsteady Pressure Transducer Coordinates.

Location	Channel number	x (inches)	y (inches)	z (inches)
Inboard flap	0	142.195	18.539	15.458
	1	144.761	19.608	11.295
	2	144.104	28.846	17.488
	3	146.730	29.901	13.413
	4	145.753	39.167	19.332
	5	148.389	40.217	15.281
Outboard flap	6	149.944	49.156	20.719
	7	152.506	50.502	17.318
	8	158.659	64.592	22.364
	9	160.899	65.754	19.420
	10	167.179	80.159	23.770
	11	169.011	81.114	21.379
Pylon	18	116.968	37.283	18.652
	19	117.142	37.176	18.380
	20	118.413	37.225	18.400
	21	119.241	38.816	19.067
	22*	119.135	39.283	18.621
	23	115.700	39.603	16.969
	24	116.619	39.631	16.995
Wingtip	25	180.217	115.703	26.805
	26	180.535	115.920	26.548
	27	179.331	115.871	26.370
	28	187.416	115.448	27.082
	29*	188.301	114.860	27.012
	30	178.129	115.446	26.175

* Bad channel.

Appendix B.

CRM-SHL-AFC Aerodynamic Data Tables with Wall Correction for Runs 45 to 172

Table B1. Aerodynamic Data Summary for Run 45 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
45 (AFC-off, increasing α)	-3.87	58.26	0.2011	1.386	1.0	0	0	0	0.2671	-0.1832	0.1387
	-3.38	58.21	0.2010	1.381	1.0	0	0	0	0.3217	-0.1815	0.1363
	-2.81	58.25	0.2011	1.380	1.0	0	0	0	0.3942	-0.1852	0.1342
	-2.30	58.20	0.2010	1.378	1.0	0	0	0	0.4609	-0.1901	0.1337
	-1.76	58.15	0.2009	1.376	1.0	0	0	0	0.5340	-0.1972	0.1352
	-1.22	58.24	0.2011	1.376	1.0	0	0	0	0.5959	-0.2025	0.1339
	-0.73	58.21	0.2010	1.375	1.0	0	0	0	0.6591	-0.2086	0.1355
	-0.15	58.31	0.2012	1.375	1.0	0	0	0	0.7215	-0.2120	0.1369
	0.32	58.22	0.2010	1.371	1.0	0	0	0	0.7794	-0.2201	0.1389
	2.42	58.19	0.2010	1.369	1.0	0	0	0	0.9491	-0.2048	0.1438
	4.47	58.20	0.2010	1.367	1.0	0	0	0	1.1063	-0.1843	0.1527
	6.62	58.16	0.2009	1.366	1.0	0	0	0	1.2630	-0.1600	0.1656
	7.63	57.82	0.2003	1.361	1.0	0	0	0	1.3392	-0.1454	0.1743
	8.67	58.31	0.2012	1.365	1.0	0	0	0	1.4120	-0.1306	0.1821
	9.68	58.09	0.2008	1.362	1.0	0	0	0	1.4909	-0.1195	0.1928
	10.71	58.04	0.2007	1.360	1.0	0	0	0	1.5637	-0.1073	0.2039
	11.78	58.20	0.2010	1.361	1.0	0	0	0	1.6377	-0.0913	0.2154
	12.77	58.21	0.2010	1.360	1.0	0	0	0	1.6982	-0.0771	0.2256
	13.83	58.11	0.2008	1.357	1.0	0	0	0	1.7669	-0.0607	0.2378
	14.85	58.16	0.2009	1.357	1.0	0	0	0	1.8264	-0.0463	0.2497
	15.90	58.53	0.2016	1.360	1.0	0	0	0	1.8846	-0.0314	0.2623
	16.41	58.29	0.2011	1.356	1.0	0	0	0	1.9172	-0.0241	0.2688
	16.93	58.46	0.2014	1.357	1.0	0	0	0	1.9450	-0.0160	0.2747
	17.42	58.45	0.2014	1.356	1.0	0	0	0	1.9753	-0.0059	0.2807
	17.92	58.37	0.2013	1.355	1.0	0	0	0	2.0002	0.0005	0.2999
	18.47	58.90	0.2022	1.360	1.0	0	0	0	2.0279	0.0088	0.3090
	18.95	58.41	0.2013	1.353	1.0	0	0	0	2.0460	0.0165	0.3160
	19.44	58.30	0.2012	1.352	1.0	0	0	0	2.0469	0.0208	0.3221
	19.97	58.54	0.2016	1.354	1.0	0	0	0	2.0335	0.0134	0.3329
	20.51	58.47	0.2014	1.352	1.0	0	0	0	2.0175	-0.0041	0.3612
	20.96	58.91	0.2022	1.356	1.0	0	0	0	2.0209	-0.0049	0.3755
	21.46	58.81	0.2020	1.354	1.0	0	0	0	2.0215	-0.0012	0.3930
	21.95	58.68	0.2018	1.351	1.0	0	0	0	2.0248	0.0057	0.4085
	22.43	58.73	0.2019	1.351	1.0	0	0	0	2.0458	-0.0061	0.4137
	22.91	58.60	0.2017	1.349	1.0	0	0	0	2.0162	0.0252	0.4352
	23.43	58.75	0.2019	1.350	1.0	0	0	0	1.9764	0.0254	0.4494
	23.97	58.84	0.2021	1.349	1.0	0	0	0	1.9363	0.0266	0.4749

Table B2. Aerodynamic Data Summary for Run 46 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
46 (AFC-off, decreasing α)	23.97	58.65	0.2018	1.346	1.0	0	0	0	1.9389	0.0292	0.4731
	23.37	58.68	0.2018	1.345	1.0	0	0	0	1.9751	0.0383	0.4501
	22.95	58.70	0.2018	1.345	1.0	0	0	0	2.0133	0.0243	0.4408
	22.44	58.75	0.2019	1.346	1.0	0	0	0	2.0275	0.0124	0.4226
	21.95	58.61	0.2017	1.344	1.0	0	0	0	2.0354	-0.0009	0.4039
	21.44	58.51	0.2015	1.342	1.0	0	0	0	2.0326	-0.0070	0.3882
	20.97	58.37	0.2013	1.340	1.0	0	0	0	2.0204	-0.0105	0.3739
	20.42	58.53	0.2016	1.341	1.0	0	0	0	2.0168	-0.0118	0.3577
	19.90	58.35	0.2012	1.339	1.0	0	0	0	2.0376	0.0089	0.3312
	19.36	58.19	0.2009	1.337	1.0	0	0	0	2.0523	0.0169	0.3210
	18.91	58.33	0.2012	1.338	1.0	0	0	0	2.0488	0.0115	0.3155
	18.43	58.09	0.2008	1.335	1.0	0	0	0	2.0302	0.0042	0.3078
	17.88	58.39	0.2013	1.338	1.0	0	0	0	2.0030	-0.0053	0.2986
	17.46	58.38	0.2013	1.337	1.0	0	0	0	1.9779	-0.0115	0.2918
	16.89	58.44	0.2014	1.338	1.0	0	0	0	1.9462	-0.0211	0.2828
	16.39	58.19	0.2009	1.334	1.0	0	0	0	1.9186	-0.0280	0.2756
	15.89	58.33	0.2012	1.336	1.0	0	0	0	1.8871	-0.0355	0.2684
	14.83	58.40	0.2013	1.336	1.0	0	0	0	1.8225	-0.0511	0.2533
	13.83	58.19	0.2009	1.333	1.0	0	0	0	1.7619	-0.0663	0.2404
	12.72	58.28	0.2011	1.334	1.0	0	0	0	1.6952	-0.0812	0.2263
	11.78	58.25	0.2010	1.333	1.0	0	0	0	1.6343	-0.0945	0.2151
	10.71	58.24	0.2010	1.333	1.0	0	0	0	1.5603	-0.1090	0.2033
	9.66	58.28	0.2011	1.333	1.0	0	0	0	1.4898	-0.1220	0.1920
	8.67	58.33	0.2012	1.333	1.0	0	0	0	1.4131	-0.1325	0.1826
	7.61	58.29	0.2011	1.332	1.0	0	0	0	1.3368	-0.1444	0.1736
	6.61	58.35	0.2012	1.333	1.0	0	0	0	1.2621	-0.1576	0.1662
	4.54	58.35	0.2012	1.332	1.0	0	0	0	1.1102	-0.1831	0.1523
	2.40	58.25	0.2010	1.331	1.0	0	0	0	0.9481	-0.2049	0.1429
	0.34	58.32	0.2012	1.331	1.0	0	0	0	0.7796	-0.2204	0.1381
	-0.15	58.17	0.2009	1.329	1.0	0	0	0	0.7206	-0.2130	0.1369
	-0.79	58.27	0.2011	1.330	1.0	0	0	0	0.6501	-0.2091	0.1353
	-1.37	58.29	0.2011	1.330	1.0	0	0	0	0.5770	-0.2013	0.1337
	-1.74	58.22	0.2010	1.329	1.0	0	0	0	0.5364	-0.1982	0.1346
	-2.24	58.26	0.2010	1.329	1.0	0	0	0	0.4709	-0.1930	0.1344
	-2.76	58.26	0.2010	1.329	1.0	0	0	0	0.4032	-0.1876	0.1340
	-3.40	58.27	0.2011	1.329	1.0	0	0	0	0.3206	-0.1834	0.1361
	-3.85	58.29	0.2011	1.329	1.0	0	0	0	0.2718	-0.1896	0.1380

Table B3. Aerodynamic Data Summary for Run 47 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
47 (AFC-off, with floor BLRS)	-3.89	57.98	0.2006	1.334	1.0	0	0	0	0.2681	-0.1879	0.1392
	0.39	57.86	0.2004	1.331	1.0	0	0	0	0.7872	-0.2183	0.1399
	2.40	58.10	0.2008	1.332	1.0	0	0	0	0.9518	-0.2014	0.1448
	4.56	58.08	0.2008	1.331	1.0	0	0	0	1.1205	-0.1790	0.1548
	6.58	57.94	0.2005	1.329	1.0	0	0	0	1.2717	-0.1568	0.1673
	7.61	57.79	0.2003	1.327	1.0	0	0	0	1.3519	-0.1441	0.1752
	8.66	57.93	0.2005	1.327	1.0	0	0	0	1.4298	-0.1325	0.1839
	9.69	57.95	0.2006	1.326	1.0	0	0	0	1.5104	-0.1209	0.1947
	10.72	58.02	0.2007	1.326	1.0	0	0	0	1.5848	-0.1087	0.2052
	11.74	57.81	0.2003	1.323	1.0	0	0	0	1.6570	-0.0943	0.2157
	12.77	57.92	0.2005	1.324	1.0	0	0	0	1.7237	-0.0790	0.2267
	13.84	57.98	0.2006	1.324	1.0	0	0	0	1.7936	-0.0628	0.2390
	14.85	58.03	0.2007	1.324	1.0	0	0	0	1.8517	-0.0480	0.2509
	15.88	57.90	0.2005	1.322	1.0	0	0	0	1.9091	-0.0321	0.2632
	16.36	57.79	0.2003	1.320	1.0	0	0	0	1.9398	-0.0238	0.2699
	16.90	57.89	0.2005	1.321	1.0	0	0	0	1.9697	-0.0147	0.2767
	17.40	58.24	0.2011	1.324	1.0	0	0	0	1.9955	-0.0037	0.2939
	17.94	58.04	0.2007	1.320	1.0	0	0	0	2.0258	0.0073	0.3029
	18.41	57.99	0.2006	1.319	1.0	0	0	0	2.0499	0.0162	0.3108
	18.93	57.96	0.2006	1.317	1.0	0	0	0	2.0645	0.0253	0.3187
	19.43	58.48	0.2015	1.323	1.0	0	0	0	2.0714	0.0323	0.3256
	19.95	58.32	0.2012	1.321	1.0	0	0	0	2.0684	0.0332	0.3348

Table B4. Aerodynamic Data Summary for Run 52 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
52 (AFC-off)	-3.89	59.55	0.2031	1.387	1.0	0	0	0	0.2683	-0.1840	0.1375
	0.37	57.70	0.1998	1.356	1.0	0	0	0	0.7871	-0.2229	0.1383
	2.45	57.42	0.1993	1.351	1.0	0	0	0	0.9550	-0.2063	0.1436
	4.52	58.36	0.2010	1.359	1.0	0	0	0	1.1158	-0.1873	0.1530
	6.60	58.38	0.2010	1.358	1.0	0	0	0	1.2717	-0.1655	0.1658
	7.61	58.14	0.2006	1.354	1.0	0	0	0	1.3469	-0.1549	0.1734
	8.68	58.51	0.2013	1.353	1.0	0	0	0	1.4243	-0.1426	0.1818
	9.69	58.41	0.2011	1.351	1.0	0	0	0	1.5048	-0.1329	0.1926
	10.74	58.22	0.2008	1.349	1.0	0	0	0	1.5816	-0.1219	0.2036
	11.76	58.30	0.2009	1.350	1.0	0	0	0	1.6502	-0.1081	0.2135
	12.78	58.43	0.2011	1.347	1.0	0	0	0	1.7193	-0.0951	0.2246
	13.82	58.39	0.2011	1.346	1.0	0	0	0	1.7862	-0.0805	0.2368
	14.86	58.36	0.2010	1.345	1.0	0	0	0	1.8454	-0.0664	0.2483
	15.88	58.09	0.2005	1.341	1.0	0	0	0	1.9046	-0.0521	0.2609
	16.42	58.50	0.2013	1.346	1.0	0	0	0	1.9361	-0.0446	0.2678
	16.92	58.46	0.2012	1.343	1.0	0	0	0	1.9658	-0.0359	0.2745
	17.40	58.55	0.2013	1.343	1.0	0	0	0	1.9883	-0.0259	0.2801
	17.93	58.44	0.2012	1.342	1.0	0	0	0	2.0197	-0.0192	0.3008
	18.44	58.61	0.2015	1.344	1.0	0	0	0	2.0420	-0.0114	0.3096
	18.96	58.52	0.2013	1.339	1.0	0	0	0	2.0518	-0.0034	0.3164
	19.43	58.88	0.2019	1.343	1.0	0	0	0	2.0524	-0.0006	0.3227
	19.94	58.51	0.2013	1.339	1.0	0	0	0	2.0384	-0.0045	0.3313

Table B5. Aerodynamic Data Summary for Run 54 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
	-3.85	58.45	0.2012	1.350	1.0	0	0	0	0.2790	-0.1878	0.1357
	0.39	58.16	0.2007	1.345	1.0	0	0	0	0.7870	-0.2224	0.1343
	2.48	58.20	0.2008	1.344	1.0	0	0	0	0.9586	-0.2073	0.1412
	4.52	58.26	0.2009	1.344	1.0	0	0	0	1.1165	-0.1874	0.1505
	6.60	58.40	0.2011	1.346	1.0	0	0	0	1.2743	-0.1656	0.1634
	7.64	58.15	0.2007	1.342	1.0	0	0	0	1.3526	-0.1553	0.1726
	8.64	58.03	0.2005	1.340	1.0	0	0	0	1.4274	-0.1432	0.1804
	9.71	58.05	0.2005	1.339	1.0	0	0	0	1.5102	-0.1336	0.1917
	10.72	58.28	0.2009	1.341	1.0	0	0	0	1.5845	-0.1220	0.2024
54	11.75	58.47	0.2012	1.343	1.0	0	0	0	1.6553	-0.1085	0.2127
	12.78	58.32	0.2010	1.341	1.0	0	0	0	1.7221	-0.0944	0.2239
(AFC-off, repeat)	13.82	58.43	0.2012	1.342	1.0	0	0	0	1.7893	-0.0809	0.2365
	14.86	58.37	0.2011	1.340	1.0	0	0	0	1.8492	-0.0662	0.2484
	15.88	58.23	0.2008	1.338	1.0	0	0	0	1.9083	-0.0515	0.2606
	16.38	58.45	0.2012	1.339	1.0	0	0	0	1.9357	-0.0442	0.2668
	16.92	58.49	0.2013	1.339	1.0	0	0	0	1.9644	-0.0347	0.2737
	17.40	58.81	0.2018	1.343	1.0	0	0	0	1.9907	-0.0256	0.2800
	17.93	58.61	0.2015	1.340	1.0	0	0	0	2.0207	-0.0178	0.3005
	18.44	58.37	0.2011	1.337	1.0	0	0	0	2.0381	-0.0098	0.3084
	18.93	58.63	0.2015	1.339	1.0	0	0	0	2.0490	-0.0033	0.3155
	19.44	58.37	0.2010	1.336	1.0	0	0	0	2.0508	0.0020	0.3224
	19.94	58.42	0.2011	1.337	1.0	0	0	0	2.0398	-0.0055	0.3320

Table B6. Aerodynamic Data Summary for Run 57 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
	-3.71	58.50	0.2011	1.386	1.55	0.62	0.0136	0.0995	0.6691	-0.2903	0.1529
	0.51	58.40	0.2009	1.384	1.55	0.62	0.0136	0.0996	1.1072	-0.3034	0.1638
	2.60	58.46	0.2010	1.384	1.55	0.63	0.0138	0.1001	1.2790	-0.2875	0.1760
	4.67	58.40	0.2009	1.382	1.55	0.63	0.0137	0.1004	1.4411	-0.2702	0.1916
	6.73	58.43	0.2010	1.381	1.55	0.63	0.0138	0.1006	1.5931	-0.2458	0.2089
	7.74	58.64	0.2014	1.383	1.55	0.63	0.0137	0.1001	1.6702	-0.2360	0.2202
	8.81	58.35	0.2008	1.379	1.56	0.63	0.0137	0.1006	1.7533	-0.2256	0.2329
	9.85	58.39	0.2009	1.379	1.52	0.61	0.0132	0.0963	1.8180	-0.2098	0.2430
	10.86	58.33	0.2008	1.377	1.51	0.61	0.0130	0.0949	1.8866	-0.1980	0.2540
	11.88	58.27	0.2007	1.376	1.51	0.60	0.0127	0.0943	1.9513	-0.1841	0.2645
57	12.94	58.25	0.2007	1.375	1.51	0.60	0.0129	0.0950	2.0215	-0.1705	0.2770
	13.95	58.64	0.2014	1.379	1.52	0.61	0.0130	0.0949	2.0808	-0.1562	0.2876
(HELP-8C)	14.99	58.71	0.2015	1.379	1.52	0.61	0.0129	0.0948	2.1426	-0.1396	0.3003
	16.02	58.48	0.2011	1.376	1.53	0.61	0.0132	0.0971	2.2030	-0.1238	0.3143
	16.51	58.61	0.2013	1.376	1.54	0.62	0.0134	0.0988	2.2329	-0.1151	0.3207
	17.05	58.46	0.2010	1.374	1.56	0.63	0.0140	0.1021	2.2569	-0.1063	0.3267
	17.52	58.81	0.2017	1.377	1.57	0.64	0.0140	0.1030	2.2480	-0.1017	0.3405
	18.04	58.63	0.2013	1.374	1.58	0.64	0.0140	0.1036	2.2538	-0.0939	0.3459
	18.54	58.66	0.2014	1.374	1.58	0.63	0.0138	0.1028	2.2546	-0.0867	0.3502
	19.04	58.57	0.2012	1.372	1.58	0.64	0.0142	0.1045	2.2323	-0.0827	0.3534
	19.50	58.63	0.2013	1.372	1.58	0.64	0.0142	0.1047	2.1671	-0.1134	0.3679
	19.99	59.03	0.2021	1.376	1.58	0.64	0.0138	0.1028	2.1451	-0.1251	0.3865

Table B7. Aerodynamic Data Summary for Run 59 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
59 (HELP-8C)	-3.64	58.49	0.2011	1.331	1.94	0.79	0.0205	0.1598	0.7899	-0.3151	0.1542
	0.58	58.61	0.2013	1.330	1.94	0.80	0.0207	0.1609	1.2023	-0.3196	0.1692
	2.63	58.33	0.2008	1.326	1.94	0.79	0.0206	0.1619	1.3714	-0.3048	0.1841
	4.73	58.34	0.2008	1.324	1.95	0.80	0.0207	0.1629	1.5323	-0.2861	0.1996
	6.77	58.48	0.2011	1.325	1.96	0.80	0.0205	0.1633	1.6832	-0.2626	0.2182
	7.81	58.12	0.2004	1.321	1.95	0.80	0.0208	0.1644	1.7698	-0.2536	0.2315
	8.85	58.65	0.2014	1.324	1.96	0.80	0.0202	0.1625	1.8485	-0.2419	0.2436
	9.88	58.02	0.2003	1.317	1.95	0.80	0.0207	0.1652	1.9246	-0.2308	0.2559
	10.91	58.57	0.2012	1.321	1.95	0.80	0.0207	0.1642	1.9944	-0.2181	0.2675
	11.93	57.82	0.1999	1.312	1.95	0.80	0.0207	0.1660	2.0648	-0.2051	0.2801
	12.98	58.70	0.2015	1.321	1.95	0.80	0.0207	0.1633	2.1266	-0.1913	0.2916
	14.00	58.50	0.2011	1.318	1.95	0.80	0.0207	0.1638	2.1887	-0.1774	0.3032
	15.02	58.49	0.2011	1.318	1.96	0.81	0.0209	0.1653	2.2431	-0.1637	0.3151
	16.06	58.40	0.2009	1.317	1.95	0.79	0.0205	0.1628	2.2961	-0.1456	0.3274
	16.54	58.66	0.2014	1.319	1.95	0.79	0.0202	0.1612	2.3251	-0.1370	0.3340
	17.09	58.63	0.2013	1.317	1.94	0.80	0.0207	0.1620	2.3208	-0.1290	0.3487
	17.56	58.67	0.2014	1.317	1.95	0.79	0.0203	0.1608	2.3272	-0.1218	0.3520
	18.07	58.81	0.2016	1.318	1.94	0.79	0.0202	0.1591	2.3229	-0.1141	0.3550
	18.56	58.81	0.2016	1.317	1.94	0.79	0.0205	0.1603	2.3108	-0.1073	0.3571
	19.05	58.78	0.2016	1.315	1.94	0.78	0.0201	0.1580	2.2661	-0.1120	0.3600
	19.52	58.83	0.2017	1.315	1.94	0.78	0.0200	0.1578	2.2056	-0.1485	0.3825
	20.02	58.79	0.2016	1.315	1.94	0.78	0.0202	0.1582	2.2087	-0.1471	0.3969

Table B8. Aerodynamic Data Summary for Run 60 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
60 (HELP-8C)	-3.73	58.41	0.2011	1.312	1.24	0.44	0.0074	0.0576	0.5316	-0.2621	0.1433
	0.48	58.44	0.2011	1.309	1.25	0.44	0.0075	0.0585	0.9855	-0.2842	0.1473
	2.54	58.14	0.2006	1.305	1.25	0.44	0.0075	0.0588	1.1681	-0.2700	0.1604
	4.64	58.38	0.2010	1.305	1.26	0.45	0.0077	0.0594	1.3341	-0.2524	0.1754
	6.70	58.29	0.2009	1.304	1.26	0.45	0.0077	0.0598	1.4903	-0.2314	0.1911
	7.71	58.47	0.2012	1.306	1.26	0.45	0.0075	0.0590	1.5615	-0.2205	0.2000
	8.73	58.32	0.2009	1.302	1.24	0.43	0.0071	0.0561	1.6298	-0.2065	0.2083
	9.78	58.42	0.2011	1.303	1.24	0.43	0.0070	0.0559	1.7046	-0.1927	0.2195
	10.81	58.17	0.2007	1.300	1.24	0.43	0.0072	0.0567	1.7767	-0.1800	0.2305
	11.83	58.45	0.2012	1.303	1.24	0.43	0.0071	0.0564	1.8430	-0.1647	0.2413
	12.88	58.71	0.2016	1.304	1.25	0.45	0.0077	0.0591	1.9110	-0.1516	0.2528
	13.90	58.27	0.2009	1.299	1.24	0.43	0.0071	0.0565	1.9655	-0.1333	0.2625
	14.94	58.43	0.2011	1.301	1.24	0.43	0.0071	0.0565	2.0269	-0.1155	0.2744
	15.96	58.47	0.2012	1.301	1.24	0.43	0.0071	0.0565	2.0794	-0.0986	0.2871
	16.44	58.54	0.2014	1.302	1.25	0.43	0.0072	0.0571	2.1031	-0.0906	0.2925
	16.98	58.43	0.2012	1.297	1.26	0.44	0.0074	0.0589	2.1302	-0.0825	0.3102
	17.48	58.64	0.2015	1.299	1.29	0.46	0.0080	0.0623	2.1638	-0.0776	0.3195
	18.02	58.66	0.2016	1.300	1.29	0.46	0.0081	0.0627	2.1770	-0.0689	0.3265
	18.48	58.66	0.2016	1.299	1.29	0.46	0.0079	0.0623	2.1774	-0.0607	0.3296
	19.00	58.72	0.2017	1.300	1.25	0.43	0.0071	0.0571	2.1531	-0.0472	0.3310
	19.47	58.60	0.2014	1.298	1.25	0.44	0.0072	0.0575	2.1019	-0.0740	0.3448
	19.96	58.70	0.2016	1.299	1.26	0.43	0.0071	0.0572	2.0833	-0.0914	0.3651

Table B9. Aerodynamic Data Summary for Run 61 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
61 (HELP-4C)	-3.70	58.44	0.2012	1.293	2.29	0.48	0.0108	0.1169	0.6435	-0.2292	0.1570
	0.52	58.24	0.2008	1.290	2.18	0.46	0.0101	0.1057	1.0749	-0.2465	0.1681
	2.58	58.31	0.2009	1.290	2.22	0.46	0.0103	0.1087	1.2505	-0.2343	0.1809
	4.65	58.42	0.2011	1.290	2.19	0.46	0.0102	0.1061	1.4047	-0.2164	0.1945
	6.73	58.28	0.2009	1.288	2.19	0.46	0.0102	0.1066	1.5613	-0.1936	0.2125
	7.75	58.47	0.2012	1.290	2.20	0.46	0.0101	0.1059	1.6429	-0.1835	0.2240
	8.78	58.36	0.2010	1.289	2.25	0.47	0.0105	0.1119	1.7313	-0.1753	0.2372
	9.81	58.58	0.2014	1.290	2.28	0.48	0.0107	0.1145	1.8114	-0.1636	0.2488
	10.86	58.32	0.2010	1.287	2.29	0.48	0.0107	0.1167	1.8868	-0.1514	0.2617
	11.88	58.62	0.2015	1.291	2.30	0.48	0.0106	0.1158	1.9549	-0.1369	0.2732
	12.93	58.38	0.2011	1.288	2.18	0.46	0.0102	0.1055	2.0068	-0.1182	0.2819
	13.95	58.43	0.2012	1.288	2.19	0.46	0.0101	0.1059	2.0661	-0.1028	0.2931
	14.98	58.48	0.2013	1.289	2.19	0.46	0.0101	0.1059	2.1182	-0.0880	0.3030
	16.00	58.33	0.2010	1.287	2.19	0.46	0.0102	0.1067	2.1695	-0.0693	0.3147
	16.50	58.57	0.2014	1.289	2.20	0.46	0.0102	0.1064	2.1955	-0.0578	0.3210
	17.04	58.71	0.2017	1.290	2.31	0.48	0.0107	0.1173	2.2194	-0.0503	0.3385
	17.51	58.78	0.2018	1.291	2.31	0.48	0.0106	0.1170	2.2252	-0.0411	0.3424
	18.04	58.44	0.2012	1.286	2.31	0.49	0.0109	0.1191	2.2237	-0.0323	0.3461
	18.52	58.61	0.2015	1.288	2.29	0.48	0.0109	0.1170	2.2103	-0.0235	0.3474
	18.99	58.47	0.2013	1.287	2.19	0.46	0.0103	0.1070	2.1719	-0.0185	0.3452
	19.49	58.55	0.2014	1.287	2.20	0.46	0.0102	0.1069	2.1013	-0.0427	0.3526
	19.95	58.80	0.2019	1.290	2.20	0.46	0.0100	0.1056	2.0925	-0.0581	0.3712

Table B10. Aerodynamic Data Summary for Run 62 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
62 (HELP-4C)	-3.77	58.43	0.2012	1.292	1.51	0.31	0.0056	0.0488	0.4916	-0.2094	0.1511
	0.46	58.37	0.2011	1.290	1.52	0.31	0.0056	0.0492	0.9589	-0.2339	0.1565
	2.53	58.22	0.2008	1.288	1.58	0.32	0.0060	0.0533	1.1461	-0.2207	0.1684
	4.61	58.41	0.2011	1.289	1.60	0.33	0.0062	0.0552	1.3084	-0.2026	0.1815
	6.69	58.14	0.2007	1.286	1.61	0.33	0.0064	0.0565	1.4700	-0.1823	0.1989
	7.70	58.41	0.2011	1.289	1.61	0.33	0.0064	0.0561	1.5441	-0.1712	0.2084
	8.73	58.45	0.2012	1.289	1.61	0.33	0.0063	0.0557	1.6277	-0.1609	0.2195
	9.78	58.50	0.2013	1.290	1.61	0.33	0.0064	0.0559	1.7057	-0.1497	0.2311
	10.80	58.57	0.2014	1.291	1.50	0.30	0.0054	0.0476	1.7578	-0.1340	0.2385
	11.82	58.16	0.2007	1.286	1.51	0.30	0.0056	0.0490	1.8256	-0.1200	0.2490
	12.87	58.40	0.2011	1.289	1.51	0.30	0.0056	0.0487	1.8909	-0.1051	0.2602
	13.89	58.48	0.2013	1.290	1.52	0.30	0.0055	0.0486	1.9547	-0.0911	0.2715
	14.91	58.37	0.2011	1.288	1.52	0.30	0.0056	0.0491	2.0157	-0.0748	0.2824
	15.96	58.36	0.2011	1.288	1.57	0.32	0.0060	0.0531	2.0736	-0.0597	0.2960
	16.44	58.57	0.2014	1.291	1.61	0.33	0.0063	0.0557	2.1018	-0.0505	0.3026
	16.97	58.44	0.2012	1.289	1.55	0.31	0.0057	0.0505	2.1066	-0.0420	0.3162
	17.47	58.59	0.2015	1.290	1.59	0.32	0.0062	0.0542	2.1334	-0.0332	0.3244
	17.99	58.48	0.2013	1.289	1.61	0.33	0.0063	0.0559	2.1483	-0.0258	0.3303
	18.51	58.77	0.2018	1.292	1.61	0.33	0.0064	0.0559	2.1489	-0.0162	0.3347
	18.97	58.67	0.2016	1.290	1.60	0.33	0.0063	0.0555	2.1327	-0.0107	0.3366
	19.46	58.63	0.2015	1.291	1.52	0.30	0.0054	0.0481	2.0691	-0.0318	0.3431
	19.95	58.69	0.2016	1.291	1.52	0.31	0.0056	0.0491	2.0511	-0.0518	0.3646

Table B11. Aerodynamic Data Summary for Run 63 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
63 (HELP-6C)	-3.66	59.10	0.2019	1.369	2.06	0.64	0.0156	0.1349	0.7303	-0.2630	0.1576
	0.55	59.08	0.2018	1.359	1.99	0.62	0.0151	0.1273	1.1415	-0.2703	0.1695
	2.62	58.72	0.2012	1.354	2.01	0.62	0.0151	0.1296	1.3193	-0.2574	0.1840
	4.69	59.09	0.2018	1.355	2.03	0.64	0.0157	0.1332	1.4803	-0.2412	0.2000
	6.75	59.05	0.2018	1.354	2.03	0.63	0.0155	0.1323	1.6327	-0.2183	0.2182
	7.79	58.84	0.2014	1.352	2.03	0.64	0.0156	0.1336	1.7190	-0.2087	0.2316
	8.81	59.19	0.2020	1.354	2.03	0.64	0.0155	0.1324	1.7945	-0.1993	0.2430
	9.86	58.81	0.2013	1.349	2.03	0.63	0.0156	0.1335	1.8757	-0.1879	0.2559
	10.89	59.17	0.2020	1.353	2.03	0.63	0.0152	0.1309	1.9476	-0.1750	0.2685
	11.94	59.02	0.2017	1.351	2.03	0.63	0.0155	0.1327	2.0177	-0.1618	0.2805
	12.97	58.84	0.2014	1.347	2.03	0.63	0.0156	0.1336	2.0869	-0.1481	0.2929
	13.97	58.98	0.2017	1.349	2.03	0.63	0.0155	0.1330	2.1446	-0.1342	0.3032
	15.00	59.10	0.2019	1.350	2.03	0.63	0.0154	0.1322	2.1965	-0.1191	0.3145
	16.04	58.87	0.2014	1.348	2.03	0.63	0.0156	0.1334	2.2423	-0.1013	0.3264
	16.54	59.15	0.2019	1.351	2.00	0.62	0.0151	0.1273	2.2710	-0.0882	0.3317
	17.04	59.18	0.2020	1.349	1.99	0.61	0.0148	0.1256	2.2572	-0.0802	0.3433
	17.54	59.15	0.2019	1.349	1.99	0.62	0.0150	0.1267	2.2709	-0.0718	0.3496
	18.05	58.88	0.2014	1.346	1.99	0.62	0.0151	0.1279	2.2719	-0.0625	0.3530
	18.55	59.17	0.2020	1.349	2.01	0.62	0.0150	0.1278	2.2656	-0.0550	0.3561
	19.02	59.29	0.2022	1.350	2.02	0.63	0.0151	0.1299	2.2308	-0.0548	0.3577
	19.51	59.42	0.2024	1.351	2.04	0.63	0.0153	0.1318	2.1680	-0.0871	0.3738
	20.01	59.48	0.2025	1.352	2.05	0.64	0.0154	0.1334	2.1621	-0.0939	0.3909

Table B12. Aerodynamic Data Summary for Run 64 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
64 (HELP-6C)	-3.69	59.09	0.2018	1.346	1.97	0.61	0.0150	0.1249	0.6838	-0.2661	0.1523
	0.54	59.04	0.2017	1.345	1.97	0.61	0.0147	0.1239	1.1176	-0.2820	0.1641
	2.60	58.80	0.2013	1.342	1.97	0.61	0.0149	0.1248	1.2876	-0.2698	0.1773
	4.67	58.87	0.2014	1.341	1.97	0.62	0.0152	0.1260	1.4504	-0.2533	0.1920
	6.73	58.85	0.2014	1.341	1.97	0.61	0.0149	0.1249	1.6060	-0.2315	0.2110
	7.77	58.89	0.2014	1.342	1.98	0.61	0.0149	0.1255	1.6885	-0.2214	0.2231
	8.81	58.91	0.2015	1.341	2.03	0.63	0.0156	0.1333	1.7782	-0.2138	0.2365
	9.85	59.34	0.2022	1.346	2.04	0.64	0.0156	0.1333	1.8555	-0.2017	0.2487
	10.88	59.35	0.2022	1.346	2.04	0.63	0.0154	0.1328	1.9259	-0.1889	0.2606
	11.91	59.35	0.2023	1.346	2.04	0.64	0.0155	0.1339	1.9931	-0.1752	0.2718
	12.93	58.81	0.2013	1.339	1.95	0.61	0.0148	0.1232	2.0438	-0.1576	0.2810
	13.97	59.17	0.2019	1.343	1.96	0.61	0.0146	0.1221	2.1036	-0.1421	0.2920
	14.96	59.32	0.2022	1.344	1.96	0.61	0.0146	0.1220	2.1541	-0.1275	0.3018
	16.03	59.26	0.2021	1.343	1.96	0.61	0.0147	0.1226	2.2051	-0.1106	0.3143
	16.52	59.07	0.2018	1.341	1.96	0.61	0.0147	0.1233	2.2360	-0.1003	0.3210
	17.04	59.17	0.2019	1.341	2.06	0.64	0.0155	0.1357	2.2532	-0.0952	0.3375
	17.52	59.29	0.2021	1.343	2.06	0.64	0.0154	0.1351	2.2658	-0.0874	0.3432
	18.05	59.10	0.2018	1.340	2.06	0.64	0.0157	0.1372	2.2681	-0.0792	0.3474
	18.55	59.41	0.2024	1.344	2.06	0.64	0.0154	0.1352	2.2580	-0.0715	0.3502
	19.04	59.22	0.2020	1.341	2.02	0.64	0.0156	0.1330	2.2210	-0.0701	0.3512
	19.48	59.22	0.2020	1.341	1.96	0.61	0.0150	0.1245	2.1475	-0.0988	0.3615
	20.02	59.10	0.2018	1.339	1.97	0.61	0.0149	0.1250	2.1387	-0.1113	0.3814

Table B13. Aerodynamic Data Summary for Run 66 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
66 (AFC-off, M_∞ = 0.15)	-3.85	33.68	0.1514	1.039	0.99	0	0	0	0.2854	-0.2021	0.1370
	0.38	33.55	0.1511	1.034	0.99	0	0	0	0.7821	-0.2156	0.1384
	2.45	33.39	0.1507	1.031	0.99	0	0	0	0.9557	-0.2050	0.1441
	4.52	33.37	0.1507	1.031	0.99	0	0	0	1.1167	-0.1870	0.1534
	6.58	33.52	0.1510	1.033	0.99	0	0	0	1.2758	-0.1664	0.1669
	7.62	33.44	0.1509	1.031	0.99	0	0	0	1.3494	-0.1557	0.1744
	8.66	33.44	0.1508	1.031	0.99	0	0	0	1.4280	-0.1440	0.1833
	9.67	33.57	0.1511	1.033	0.99	0	0	0	1.5066	-0.1338	0.1933
	10.71	33.46	0.1509	1.031	0.99	0	0	0	1.5815	-0.1229	0.2036
	11.75	33.52	0.1511	1.032	0.99	0	0	0	1.6513	-0.1103	0.2141
	12.78	33.54	0.1511	1.032	0.99	0	0	0	1.7180	-0.0944	0.2250
	13.82	33.67	0.1514	1.034	0.99	0	0	0	1.7823	-0.0807	0.2367
	14.86	33.59	0.1512	1.032	0.99	0	0	0	1.8439	-0.0666	0.2487
	15.87	33.59	0.1512	1.032	0.99	0	0	0	1.9033	-0.0515	0.2613
	16.40	33.68	0.1514	1.033	0.99	0	0	0	1.9319	-0.0432	0.2678
	16.91	33.56	0.1511	1.031	0.99	0	0	0	1.9635	-0.0348	0.2847
	17.41	33.57	0.1512	1.031	0.99	0	0	0	1.9909	-0.0264	0.2932
	17.91	33.62	0.1513	1.032	0.99	0	0	0	2.0166	-0.0176	0.3005
	18.45	33.69	0.1514	1.033	0.99	0	0	0	2.0400	-0.0084	0.3094
	18.94	33.68	0.1514	1.033	0.99	0	0	0	2.0486	0.0005	0.3158
	19.45	33.80	0.1517	1.035	0.99	0	0	0	2.0553	0.0045	0.3238
	19.95	33.67	0.1514	1.033	0.99	0	0	0	2.0457	0.0031	0.3305

Table B14. Aerodynamic Data Summary for Run 67 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
67 (HELP-8C, M_∞ = 0.15)	-3.54	33.54	0.1511	1.030	1.89	0.79	0.0356	0.3635	1.0101	-0.3585	0.1666
	0.66	33.40	0.1508	1.028	1.90	0.79	0.0356	0.3653	1.3967	-0.3513	0.1906
	2.71	33.58	0.1512	1.031	1.89	0.80	0.0358	0.3641	1.5482	-0.3354	0.2053
	4.81	33.67	0.1514	1.032	1.90	0.79	0.0355	0.3617	1.7038	-0.3173	0.2234
	6.85	33.53	0.1511	1.030	1.90	0.79	0.0354	0.3631	1.8625	-0.2968	0.2470
	7.87	33.58	0.1512	1.031	1.89	0.79	0.0350	0.3597	1.9355	-0.2863	0.2586
	8.93	33.63	0.1513	1.031	1.88	0.77	0.0343	0.3513	2.0144	-0.2754	0.2719
	9.96	33.63	0.1513	1.031	1.88	0.78	0.0351	0.3551	2.0908	-0.2639	0.2856
	10.99	33.50	0.1510	1.029	1.88	0.77	0.0343	0.3514	2.1595	-0.2504	0.2984
	11.99	33.62	0.1513	1.031	1.88	0.78	0.0351	0.3539	2.2231	-0.2376	0.3101
	13.06	33.73	0.1515	1.032	1.88	0.78	0.0350	0.3522	2.2803	-0.2217	0.3217
	14.05	33.54	0.1511	1.029	1.87	0.78	0.0349	0.3519	2.3264	-0.2065	0.3312
	15.08	33.71	0.1515	1.032	1.87	0.78	0.0351	0.3505	2.3702	-0.1896	0.3422
	16.13	33.60	0.1512	1.030	1.91	0.79	0.0357	0.3637	2.4358	-0.1711	0.3700
	16.61	33.71	0.1515	1.032	1.87	0.78	0.0347	0.3491	2.4392	-0.1605	0.3732
	17.13	33.61	0.1513	1.030	1.88	0.77	0.0345	0.3516	2.4467	-0.1542	0.3773
	17.62	33.66	0.1514	1.030	1.89	0.78	0.0353	0.3564	2.4429	-0.1464	0.3806
	18.10	33.58	0.1512	1.029	1.89	0.78	0.0348	0.3551	2.4309	-0.1376	0.3817
	18.61	33.72	0.1515	1.031	1.88	0.78	0.0346	0.3511	2.4116	-0.1308	0.3826
	19.10	33.73	0.1516	1.031	1.89	0.78	0.0344	0.3515	2.3568	-0.1372	0.3835
	19.57	33.71	0.1515	1.031	1.88	0.77	0.0340	0.3488	2.3030	-0.1639	0.4000
	20.09	33.75	0.1516	1.031	1.89	0.78	0.0348	0.3541	2.2942	-0.1637	0.4131

Table B15. Aerodynamic Data Summary for Run 68 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
68 (HELP-8C, M_∞= 0.15)	-3.62	33.74	0.1516	1.031	1.50	0.61	0.0222	0.2187	0.8232	-0.3199	0.1587
	0.61	33.61	0.1513	1.029	1.49	0.61	0.0224	0.2186	1.2310	-0.3218	0.1743
	4.74	33.45	0.1509	1.027	1.49	0.60	0.0223	0.2179	1.5548	-0.2911	0.2046
	6.78	33.49	0.1510	1.028	1.49	0.60	0.0220	0.2171	1.7021	-0.2689	0.2231
	7.80	33.47	0.1509	1.027	1.49	0.60	0.0219	0.2162	1.7864	-0.2584	0.2360
	8.86	33.69	0.1515	1.030	1.50	0.61	0.0225	0.2195	1.8632	-0.2473	0.2481
	9.88	33.58	0.1512	1.029	1.48	0.59	0.0212	0.2100	1.9261	-0.2347	0.2583
	10.92	33.58	0.1512	1.029	1.50	0.60	0.0220	0.2169	2.0063	-0.2236	0.2722
	11.94	33.35	0.1507	1.025	1.50	0.60	0.0224	0.2203	2.0813	-0.2109	0.2856
	12.97	33.57	0.1512	1.028	1.48	0.59	0.0215	0.2126	2.1347	-0.1957	0.2953
	14.01	33.59	0.1512	1.029	1.50	0.60	0.0221	0.2177	2.2041	-0.1834	0.3089
	15.05	33.63	0.1513	1.029	1.50	0.60	0.0220	0.2170	2.2521	-0.1666	0.3201
	16.05	33.59	0.1512	1.029	1.50	0.60	0.0220	0.2168	2.3006	-0.1508	0.3324
	16.56	33.60	0.1513	1.029	1.50	0.60	0.0220	0.2168	2.3161	-0.1410	0.3486
	17.08	33.63	0.1513	1.029	1.50	0.60	0.0218	0.2158	2.3339	-0.1331	0.3544
	17.55	33.66	0.1514	1.029	1.50	0.60	0.0218	0.2155	2.3413	-0.1248	0.3589
	18.06	33.59	0.1512	1.028	1.50	0.60	0.0218	0.2161	2.3409	-0.1170	0.3627
	18.58	33.74	0.1516	1.030	1.50	0.60	0.0221	0.2176	2.3306	-0.1100	0.3652
	19.05	33.73	0.1515	1.030	1.50	0.60	0.0221	0.2174	2.2913	-0.1122	0.3673
	19.54	33.67	0.1514	1.030	1.50	0.60	0.0222	0.2187	2.2349	-0.1409	0.3847
	20.03	33.73	0.1516	1.030	1.50	0.60	0.0220	0.2167	2.2246	-0.1456	0.4004

Table B16. Aerodynamic Data Summary for Run 69 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
69 (HELP-8C, M_∞= 0.15)	0.63	33.27	0.1505	1.025	1.79	0.72	0.0298	0.3161	1.3659	-0.3309	0.1885
	4.77	32.50	0.1487	1.013	1.72	0.68	0.0283	0.2979	1.6603	-0.2952	0.2191
	8.87	33.55	0.1511	1.030	1.72	0.69	0.0275	0.2856	1.9577	-0.2522	0.2650
	13.03	33.59	0.1512	1.030	1.73	0.69	0.0276	0.2875	2.2331	-0.1991	0.3161
	17.11	33.51	0.1510	1.028	1.75	0.70	0.0284	0.2971	2.4089	-0.1292	0.3710

Table B17. Aerodynamic Data Summary for Run 71 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
71 (HELP-10C)	-3.66	58.30	0.2009	1.370	1.53	0.76	0.0172	0.1211	0.7333	-0.3417	0.1512
	0.56	58.17	0.2007	1.367	1.53	0.77	0.0177	0.1228	1.1819	-0.3627	0.1669
	2.63	58.03	0.2004	1.364	1.53	0.77	0.0176	0.1232	1.3514	-0.3458	0.1801
	4.70	58.03	0.2004	1.364	1.54	0.77	0.0178	0.1237	1.5167	-0.3290	0.1962
	6.76	57.99	0.2003	1.363	1.54	0.77	0.0176	0.1234	1.6683	-0.3060	0.2140
	7.79	58.23	0.2008	1.366	1.55	0.77	0.0177	0.1242	1.7517	-0.2953	0.2262
	8.84	58.39	0.2010	1.365	1.54	0.77	0.0174	0.1222	1.8270	-0.2816	0.2379
	9.86	57.87	0.2001	1.359	1.54	0.77	0.0178	0.1250	1.9060	-0.2679	0.2499
	10.90	58.08	0.2005	1.361	1.54	0.77	0.0178	0.1246	1.9746	-0.2542	0.2610
	11.92	58.24	0.2008	1.363	1.54	0.77	0.0176	0.1234	2.0393	-0.2394	0.2722
	12.97	58.16	0.2006	1.360	1.54	0.77	0.0177	0.1236	2.1059	-0.2247	0.2842
	13.98	58.25	0.2008	1.361	1.54	0.77	0.0177	0.1236	2.1659	-0.2093	0.2955
	15.02	58.26	0.2008	1.360	1.54	0.77	0.0176	0.1229	2.2269	-0.1936	0.3081
	16.04	58.20	0.2007	1.360	1.54	0.77	0.0174	0.1229	2.2708	-0.1775	0.3187
	16.54	58.17	0.2006	1.359	1.54	0.76	0.0174	0.1227	2.3040	-0.1683	0.3254
	17.06	58.19	0.2007	1.357	1.45	0.71	0.0153	0.1073	2.2932	-0.1461	0.3253
	17.53	58.05	0.2005	1.355	1.44	0.70	0.0150	0.1058	2.2810	-0.1385	0.3376
	18.02	58.10	0.2005	1.356	1.43	0.69	0.0147	0.1039	2.2876	-0.1281	0.3422
	18.56	58.67	0.2016	1.362	1.43	0.69	0.0144	0.1015	2.2847	-0.1182	0.3464
	19.02	58.64	0.2015	1.361	1.43	0.69	0.0144	0.1016	2.2632	-0.1153	0.3492
	19.51	58.34	0.2010	1.358	1.43	0.70	0.0148	0.1037	2.1990	-0.1545	0.3713
	20.02	58.42	0.2011	1.359	1.43	0.70	0.0148	0.1037	2.1860	-0.1613	0.3889

Table B18. Aerodynamic Data Summary for Run 72 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
72 (HELP-10C)	-3.63	58.91	0.2022	1.359	1.67	0.79	0.0177	0.1356	0.8043	-0.3370	0.1535
	0.56	58.78	0.2020	1.356	1.67	0.79	0.0176	0.1354	1.2190	-0.3479	0.1708
	2.65	58.82	0.2021	1.357	1.67	0.79	0.0177	0.1356	1.3850	-0.3291	0.1845
	4.71	58.31	0.2012	1.349	1.67	0.80	0.0181	0.1385	1.5451	-0.3111	0.2006
	6.77	58.33	0.2012	1.349	1.67	0.79	0.0177	0.1372	1.6940	-0.2871	0.2188
	7.81	58.26	0.2011	1.347	1.67	0.79	0.0179	0.1379	1.7754	-0.2742	0.2311
	8.86	58.38	0.2013	1.345	1.67	0.78	0.0173	0.1360	1.8541	-0.2634	0.2439
	9.88	58.44	0.2014	1.346	1.67	0.79	0.0178	0.1376	1.9257	-0.2487	0.2547
	10.91	58.60	0.2017	1.347	1.68	0.79	0.0179	0.1379	1.9934	-0.2334	0.2664
	11.93	58.63	0.2018	1.347	1.67	0.80	0.0182	0.1386	2.0553	-0.2159	0.2771
	12.98	58.79	0.2021	1.347	1.68	0.79	0.0176	0.1367	2.1179	-0.1987	0.2885
	14.00	58.36	0.2013	1.343	1.68	0.79	0.0177	0.1379	2.1760	-0.1816	0.2996
	15.03	58.31	0.2012	1.342	1.68	0.78	0.0174	0.1375	2.2235	-0.1629	0.3098
	16.05	58.69	0.2019	1.346	1.68	0.79	0.0175	0.1370	2.2645	-0.1413	0.3203
	16.54	58.65	0.2018	1.346	1.68	0.79	0.0177	0.1373	2.2940	-0.1288	0.3261
	17.06	58.59	0.2017	1.343	1.69	0.79	0.0177	0.1394	2.2914	-0.1214	0.3389
	17.55	58.48	0.2015	1.342	1.69	0.78	0.0174	0.1382	2.2978	-0.1130	0.3432
	18.08	58.69	0.2019	1.344	1.69	0.79	0.0174	0.1378	2.2972	-0.1039	0.3472
	18.54	58.68	0.2019	1.343	1.69	0.79	0.0176	0.1386	2.2903	-0.0983	0.3490
	19.05	58.66	0.2019	1.343	1.69	0.80	0.0179	0.1404	2.2529	-0.1011	0.3514
	19.52	58.86	0.2022	1.344	1.69	0.78	0.0172	0.1368	2.1970	-0.1324	0.3678
	20.02	58.67	0.2019	1.342	1.69	0.79	0.0178	0.1395	2.1871	-0.1439	0.3876

Table B19. Aerodynamic Data Summary for Run 73 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
73 (HELP-8C)	-3.62	58.53	0.2017	1.334	1.99	0.79	0.0195	0.1643	0.8132	-0.3089	0.1591
	0.57	58.15	0.2010	1.329	1.99	0.79	0.0194	0.1649	1.2283	-0.3153	0.1759
	2.64	58.31	0.2013	1.331	1.99	0.79	0.0194	0.1639	1.3918	-0.3003	0.1897
	4.74	58.30	0.2013	1.331	1.99	0.79	0.0198	0.1656	1.5530	-0.2818	0.2064
	6.80	58.21	0.2011	1.329	1.99	0.79	0.0195	0.1648	1.7051	-0.2589	0.2257
	7.82	58.21	0.2011	1.329	2.00	0.78	0.0192	0.1643	1.7895	-0.2495	0.2388
	8.86	58.32	0.2013	1.331	1.99	0.78	0.0192	0.1633	1.8671	-0.2379	0.2510
	9.89	58.65	0.2019	1.334	1.99	0.79	0.0193	0.1629	1.9424	-0.2268	0.2631
	10.92	58.74	0.2021	1.334	1.99	0.78	0.0191	0.1621	2.0109	-0.2133	0.2751
	11.97	58.44	0.2015	1.331	1.99	0.79	0.0192	0.1637	2.0841	-0.2003	0.2883
	13.00	58.53	0.2017	1.331	1.99	0.79	0.0195	0.1647	2.1501	-0.1860	0.3003
	14.01	58.58	0.2018	1.332	1.99	0.79	0.0193	0.1628	2.2043	-0.1710	0.3109
	15.05	58.61	0.2018	1.332	1.99	0.78	0.0191	0.1622	2.2525	-0.1551	0.3218
	16.07	58.73	0.2021	1.334	1.99	0.78	0.0191	0.1616	2.3134	-0.1355	0.3353
	16.57	58.68	0.2019	1.334	1.99	0.79	0.0194	0.1633	2.3363	-0.1267	0.3408
	17.09	58.81	0.2022	1.335	1.99	0.78	0.0191	0.1621	2.3232	-0.1185	0.3521
	17.57	58.79	0.2022	1.334	2.00	0.79	0.0194	0.1638	2.3288	-0.1110	0.3558
	18.10	58.49	0.2016	1.330	1.99	0.78	0.0192	0.1635	2.3257	-0.1028	0.3591
	18.55	58.75	0.2021	1.332	2.00	0.80	0.0196	0.1653	2.3150	-0.0955	0.3605
	19.06	58.65	0.2019	1.331	1.99	0.79	0.0193	0.1638	2.2631	-0.1012	0.3631
	19.51	58.79	0.2022	1.333	1.99	0.79	0.0193	0.1634	2.2082	-0.1343	0.3821
	20.03	58.51	0.2017	1.330	1.99	0.78	0.0191	0.1629	2.2044	-0.1281	0.3931

Table B20. Aerodynamic Data Summary for Run 74 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
74 (AFC-off, repeat)	-3.90	58.55	0.2018	1.328	1.0	0	0	0	0.2687	-0.1875	0.1391
	0.39	58.35	0.2014	1.327	1.0	0	0	0	0.7878	-0.2216	0.1392
	2.44	58.38	0.2015	1.325	1.0	0	0	0	0.9550	-0.2070	0.1446
	4.52	58.47	0.2016	1.328	1.0	0	0	0	1.1178	-0.1884	0.1538
	6.58	58.52	0.2017	1.328	1.0	0	0	0	1.2716	-0.1680	0.1664
	7.62	58.47	0.2016	1.328	1.0	0	0	0	1.3506	-0.1564	0.1746
	8.66	58.38	0.2015	1.325	1.0	0	0	0	1.4275	-0.1447	0.1825
	9.69	58.36	0.2014	1.325	1.0	0	0	0	1.5077	-0.1347	0.1929
	10.73	58.64	0.2019	1.328	1.0	0	0	0	1.5831	-0.1234	0.2041
	11.75	58.50	0.2017	1.326	1.0	0	0	0	1.6518	-0.1111	0.2141
	12.80	58.41	0.2016	1.325	1.0	0	0	0	1.7212	-0.0968	0.2256
	13.82	58.37	0.2015	1.324	1.0	0	0	0	1.7854	-0.0827	0.2371
	14.84	58.22	0.2012	1.322	1.0	0	0	0	1.8443	-0.0683	0.2481
	15.89	58.69	0.2021	1.326	1.0	0	0	0	1.9038	-0.0540	0.2612
	16.38	58.53	0.2018	1.323	1.0	0	0	0	1.9350	-0.0473	0.2678
	16.93	58.17	0.2011	1.317	1.0	0	0	0	1.9661	-0.0383	0.2743
	17.41	58.93	0.2025	1.326	1.0	0	0	0	1.9924	-0.0304	0.2928
	17.94	58.31	0.2014	1.319	1.0	0	0	0	2.0190	-0.0226	0.3007
	18.47	58.59	0.2019	1.322	1.0	0	0	0	2.0418	-0.0134	0.3096
	18.94	58.81	0.2023	1.324	1.0	0	0	0	2.0522	-0.0065	0.3160
	19.45	58.73	0.2021	1.324	1.0	0	0	0	2.0539	-0.0021	0.3222
	19.95	58.68	0.2021	1.323	1.0	0	0	0	2.0395	-0.0120	0.3331

Table B21. Aerodynamic Data Summary for Run 75 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
75 (HELP-10C)	-3.74	58.56	0.2019	1.320	1.24	0.55	0.0095	0.0709	0.5679	-0.3010	0.1397
	0.51	58.45	0.2017	1.318	1.28	0.58	0.0108	0.0782	1.0528	-0.3395	0.1517
	2.57	58.35	0.2015	1.316	1.28	0.59	0.0109	0.0788	1.2338	-0.3223	0.1649
	4.64	58.20	0.2013	1.315	1.25	0.55	0.0099	0.0729	1.3743	-0.2948	0.1768
	6.70	58.44	0.2017	1.317	1.25	0.56	0.0099	0.0728	1.5287	-0.2733	0.1926
	7.73	58.29	0.2014	1.316	1.25	0.56	0.0099	0.0734	1.6032	-0.2634	0.2015
	8.78	58.06	0.2010	1.312	1.25	0.56	0.0102	0.0747	1.6845	-0.2522	0.2135
	9.80	58.40	0.2016	1.316	1.25	0.55	0.0097	0.0721	1.7504	-0.2352	0.2230
	10.84	58.40	0.2017	1.311	1.28	0.58	0.0106	0.0777	1.8380	-0.2278	0.2369
	11.85	58.54	0.2019	1.317	1.25	0.55	0.0098	0.0724	1.8835	-0.2044	0.2444
	12.91	58.50	0.2018	1.316	1.28	0.59	0.0109	0.0789	1.9668	-0.1961	0.2592
	13.92	58.52	0.2019	1.317	1.26	0.56	0.0099	0.0733	2.0043	-0.1706	0.2657
	14.96	58.49	0.2018	1.316	1.26	0.56	0.0098	0.0731	2.0644	-0.1518	0.2778
	15.99	58.56	0.2019	1.316	1.26	0.56	0.0100	0.0737	2.1187	-0.1337	0.2908
	16.48	58.31	0.2015	1.313	1.26	0.55	0.0098	0.0733	2.1423	-0.1241	0.2960
	17.02	58.47	0.2018	1.315	1.26	0.55	0.0097	0.0732	2.1610	-0.1151	0.3121
	17.50	58.32	0.2015	1.312	1.27	0.56	0.0102	0.0758	2.1870	-0.1091	0.3199
	18.02	58.70	0.2022	1.316	1.28	0.57	0.0103	0.0764	2.2009	-0.1011	0.3255
	18.54	59.07	0.2028	1.320	1.29	0.58	0.0105	0.0771	2.2072	-0.0951	0.3310
	19.01	58.79	0.2024	1.317	1.29	0.58	0.0105	0.0776	2.1966	-0.0911	0.3344
	19.47	58.58	0.2020	1.314	1.29	0.58	0.0107	0.0788	2.1382	-0.1289	0.3544
	20.01	58.94	0.2026	1.318	1.29	0.58	0.0107	0.0785	2.1269	-0.1387	0.3745

Table B22. Aerodynamic Data Summary for Run 77 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
77 (HELP-10C-R1S)	-3.77	58.53	0.2017	1.377	1.24	0.44	0.0091	0.0567	0.4945	-0.2844	0.1327
	0.47	58.32	0.2013	1.373	1.26	0.45	0.0096	0.0592	0.9776	-0.3195	0.1392
	2.54	58.13	0.2009	1.370	1.27	0.46	0.0099	0.0607	1.1549	-0.3011	0.1510
	4.61	57.60	0.2000	1.364	1.27	0.46	0.0099	0.0615	1.3050	-0.2740	0.1641
	6.66	57.20	0.1993	1.359	1.27	0.46	0.0101	0.0627	1.4468	-0.2396	0.1782
	7.68	58.27	0.2012	1.371	1.24	0.43	0.0087	0.0554	1.4831	-0.2096	0.1816
	8.72	58.51	0.2016	1.374	1.24	0.43	0.0087	0.0554	1.5530	-0.1928	0.1910
	9.74	58.57	0.2017	1.374	1.24	0.43	0.0087	0.0553	1.6250	-0.1756	0.2006
	10.75	58.14	0.2010	1.369	1.24	0.43	0.0088	0.0561	1.6895	-0.1571	0.2113
	11.80	58.27	0.2012	1.369	1.25	0.43	0.0088	0.0563	1.7594	-0.1397	0.2233
	12.83	58.73	0.2020	1.374	1.26	0.44	0.0090	0.0573	1.8245	-0.1227	0.2346
	13.87	58.77	0.2021	1.375	1.27	0.46	0.0095	0.0593	1.8884	-0.1058	0.2469
	14.89	58.63	0.2018	1.373	1.28	0.46	0.0096	0.0603	1.9435	-0.0905	0.2584
	15.93	58.49	0.2016	1.371	1.28	0.46	0.0096	0.0606	2.0013	-0.0756	0.2722
	16.42	58.74	0.2020	1.373	1.28	0.46	0.0097	0.0608	2.0238	-0.0660	0.2779
	16.97	58.36	0.2014	1.368	1.28	0.46	0.0098	0.0614	2.0566	-0.0549	0.2848
	17.45	58.37	0.2014	1.368	1.24	0.43	0.0085	0.0551	2.0738	-0.0421	0.2896
	17.97	58.84	0.2022	1.373	1.24	0.43	0.0085	0.0549	2.0928	-0.0366	0.3086
	18.47	59.03	0.2026	1.374	1.25	0.43	0.0085	0.0548	2.1046	-0.0275	0.3143
	18.97	58.90	0.2023	1.373	1.25	0.43	0.0086	0.0552	2.1079	-0.0205	0.3194
	19.44	58.61	0.2018	1.369	1.25	0.43	0.0087	0.0558	2.0742	-0.0297	0.3249
	19.95	58.99	0.2025	1.373	1.25	0.43	0.0086	0.0553	2.0495	-0.0559	0.3494

Table B23. Aerodynamic Data Summary for Run 78 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
78 (HELP-10C-R1S)	-3.70	58.49	0.2015	1.371	1.51	0.60	0.0157	0.0937	0.6084	-0.3226	0.1408
	0.54	58.28	0.2012	1.368	1.51	0.60	0.0154	0.0931	1.0706	-0.3518	0.1522
	2.55	58.49	0.2015	1.371	1.51	0.60	0.0153	0.0927	1.2403	-0.3337	0.1645
	4.63	58.18	0.2010	1.368	1.51	0.60	0.0158	0.0949	1.4010	-0.3160	0.1788
	6.71	58.19	0.2010	1.367	1.50	0.60	0.0159	0.0944	1.5460	-0.2864	0.1943
	7.73	58.54	0.2016	1.371	1.50	0.59	0.0151	0.0913	1.6048	-0.2674	0.2018
	8.74	58.55	0.2016	1.371	1.50	0.59	0.0149	0.0909	1.6732	-0.2505	0.2113
	9.80	58.45	0.2014	1.369	1.51	0.60	0.0155	0.0934	1.7425	-0.2277	0.2217
	10.83	58.75	0.2020	1.372	1.52	0.61	0.0160	0.0948	1.8054	-0.2064	0.2322
	11.84	58.62	0.2018	1.371	1.50	0.60	0.0157	0.0930	1.8560	-0.1798	0.2410
	12.86	58.62	0.2017	1.370	1.51	0.59	0.0152	0.0921	1.9046	-0.1554	0.2501
	13.90	58.79	0.2021	1.372	1.51	0.58	0.0147	0.0903	1.9571	-0.1343	0.2612
	14.93	58.55	0.2016	1.369	1.51	0.58	0.0146	0.0908	2.0060	-0.1132	0.2722
	15.96	58.55	0.2016	1.369	1.51	0.58	0.0146	0.0908	2.0568	-0.0963	0.2852
	16.45	58.49	0.2015	1.368	1.51	0.60	0.0154	0.0930	2.0751	-0.0844	0.2899
	16.99	58.72	0.2019	1.369	1.52	0.61	0.0159	0.0948	2.1080	-0.0720	0.2967
	17.47	58.74	0.2020	1.369	1.51	0.59	0.0149	0.0914	2.1183	-0.0653	0.3129
	18.01	58.71	0.2019	1.368	1.51	0.60	0.0157	0.0939	2.1350	-0.0547	0.3191
	18.47	58.68	0.2019	1.368	1.51	0.60	0.0158	0.0937	2.1461	-0.0471	0.3242
	19.00	58.78	0.2020	1.369	1.50	0.60	0.0157	0.0932	2.1400	-0.0390	0.3281
	19.44	58.81	0.2021	1.369	1.25	0.43	0.0082	0.0546	2.0734	-0.0305	0.3274
	19.96	58.83	0.2021	1.370	1.32	0.47	0.0101	0.0644	2.0640	-0.0590	0.3530

Table B24. Aerodynamic Data Summary for Run 80 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
80 (HELP-10C-R1ENS)	-3.71	58.83	0.2021	1.376	1.51	0.67	0.0159	0.1045	0.6670	-0.3309	0.1439
	0.54	58.72	0.2019	1.374	1.51	0.68	0.0161	0.1052	1.1240	-0.3571	0.1577
	2.60	58.37	0.2013	1.369	1.53	0.69	0.0166	0.1093	1.3017	-0.3410	0.1715
	4.68	58.33	0.2012	1.368	1.53	0.69	0.0165	0.1088	1.4642	-0.3244	0.1865
	6.76	58.58	0.2016	1.371	1.52	0.68	0.0161	0.1057	1.6154	-0.3004	0.2038
	7.78	58.04	0.2007	1.364	1.53	0.69	0.0168	0.1101	1.6918	-0.2899	0.2149
	8.82	58.34	0.2012	1.367	1.52	0.68	0.0165	0.1082	1.7710	-0.2771	0.2265
	9.85	58.87	0.2022	1.373	1.52	0.68	0.0161	0.1056	1.8411	-0.2624	0.2370
	10.88	58.66	0.2018	1.371	1.52	0.68	0.0163	0.1065	1.9059	-0.2471	0.2478
	11.90	58.53	0.2016	1.369	1.51	0.67	0.0160	0.1050	1.9691	-0.2310	0.2578
	12.93	58.78	0.2020	1.372	1.51	0.67	0.0158	0.1043	2.0330	-0.2172	0.2692
	13.97	58.73	0.2019	1.371	1.56	0.70	0.0170	0.1117	2.1060	-0.2042	0.2831
	15.00	58.71	0.2019	1.371	1.54	0.69	0.0167	0.1098	2.1592	-0.1851	0.2941
	16.03	58.63	0.2017	1.370	1.53	0.69	0.0166	0.1087	2.2004	-0.1651	0.3044
	16.52	58.88	0.2022	1.373	1.54	0.69	0.0167	0.1095	2.2301	-0.1566	0.3108
	17.06	58.59	0.2017	1.369	1.55	0.69	0.0168	0.1105	2.2583	-0.1446	0.3171
	17.53	58.67	0.2018	1.369	1.55	0.70	0.0170	0.1114	2.2564	-0.1376	0.3316
	18.03	58.83	0.2021	1.371	1.55	0.69	0.0168	0.1100	2.2615	-0.1269	0.3356
	18.53	58.66	0.2018	1.369	1.54	0.68	0.0164	0.1084	2.2568	-0.1175	0.3379
	19.05	58.61	0.2017	1.368	1.55	0.69	0.0165	0.1095	2.2339	-0.1159	0.3423
	19.49	58.86	0.2022	1.370	1.55	0.69	0.0165	0.1095	2.1740	-0.1534	0.3629
	20.01	58.94	0.2023	1.371	1.55	0.69	0.0167	0.1101	2.1682	-0.1546	0.3786

Table B25. Aerodynamic Data Summary for Run 81 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
81 (HELP-10C-R1ENS)	-3.67	58.77	0.2020	1.362	1.76	0.80	0.0212	0.1446	0.7513	-0.3497	0.1492
	0.59	58.39	0.2013	1.358	1.77	0.81	0.0220	0.1492	1.1962	-0.3679	0.1661
	2.63	58.32	0.2012	1.356	1.75	0.80	0.0214	0.1458	1.3580	-0.3504	0.1784
	4.70	58.76	0.2020	1.361	1.76	0.80	0.0211	0.1443	1.5183	-0.3324	0.1935
	6.78	58.38	0.2013	1.356	1.75	0.80	0.0217	0.1466	1.6704	-0.3099	0.2121
	7.80	58.37	0.2013	1.356	1.76	0.80	0.0215	0.1463	1.7493	-0.2991	0.2240
	8.85	58.18	0.2010	1.354	1.76	0.80	0.0217	0.1478	1.8298	-0.2874	0.2362
	9.87	58.50	0.2015	1.358	1.77	0.80	0.0214	0.1462	1.9009	-0.2729	0.2472
	10.90	58.48	0.2015	1.357	1.77	0.80	0.0214	0.1464	1.9677	-0.2588	0.2584
	11.93	58.61	0.2017	1.359	1.77	0.80	0.0217	0.1471	2.0349	-0.2455	0.2695
	12.98	58.71	0.2019	1.359	1.76	0.80	0.0217	0.1463	2.1001	-0.2301	0.2821
	13.99	58.81	0.2021	1.360	1.76	0.79	0.0212	0.1435	2.1583	-0.2150	0.2926
	15.01	58.73	0.2020	1.360	1.76	0.80	0.0215	0.1449	2.2199	-0.1988	0.3048
	16.05	58.60	0.2017	1.358	1.77	0.80	0.0216	0.1460	2.2648	-0.1826	0.3163
	16.54	58.70	0.2019	1.359	1.77	0.80	0.0214	0.1454	2.2992	-0.1710	0.3232
	17.07	58.63	0.2018	1.358	1.77	0.80	0.0213	0.1454	2.3143	-0.1613	0.3270
	17.56	58.61	0.2017	1.357	1.77	0.80	0.0216	0.1464	2.3067	-0.1551	0.3417
	18.07	58.71	0.2019	1.358	1.76	0.79	0.0213	0.1447	2.3127	-0.1450	0.3463
	18.55	58.49	0.2015	1.355	1.76	0.79	0.0212	0.1451	2.3076	-0.1368	0.3485
	19.04	58.84	0.2021	1.358	1.77	0.80	0.0218	0.1462	2.2667	-0.1393	0.3517
	19.51	58.99	0.2024	1.361	1.76	0.79	0.0209	0.1421	2.2103	-0.1693	0.3719
	20.01	58.88	0.2022	1.359	1.77	0.79	0.0212	0.1442	2.2072	-0.1701	0.3870

Table B26. Aerodynamic Data Summary for Run 82 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
82 (HELP-10C-R1ENS-ST)	-3.66	58.86	0.2021	1.364	1.83	0.78	0.0191	0.1472	0.7935	-0.3446	0.1540
	0.58	58.75	0.2019	1.361	1.83	0.79	0.0193	0.1486	1.2177	-0.3596	0.1708
	2.62	58.48	0.2014	1.358	1.84	0.79	0.0194	0.1502	1.3785	-0.3424	0.1844
	4.71	58.36	0.2012	1.357	1.84	0.79	0.0196	0.1514	1.5389	-0.3226	0.2003
	6.79	58.79	0.2020	1.361	1.84	0.79	0.0194	0.1498	1.6905	-0.2985	0.2186
	7.81	58.23	0.2010	1.355	1.84	0.79	0.0196	0.1517	1.7673	-0.2862	0.2305
	8.87	58.42	0.2013	1.357	1.84	0.79	0.0194	0.1509	1.8447	-0.2725	0.2426
	9.88	58.59	0.2016	1.359	1.85	0.79	0.0195	0.1516	1.9131	-0.2585	0.2528
	10.91	58.65	0.2017	1.359	1.85	0.80	0.0196	0.1518	1.9801	-0.2447	0.2640
	11.95	58.37	0.2012	1.356	1.84	0.80	0.0198	0.1526	2.0420	-0.2263	0.2756
	12.96	58.62	0.2017	1.359	1.83	0.79	0.0196	0.1504	2.1018	-0.2084	0.2854
	13.99	58.42	0.2013	1.356	1.84	0.79	0.0197	0.1516	2.1608	-0.1899	0.2968
	15.01	58.61	0.2017	1.358	1.84	0.79	0.0194	0.1505	2.2132	-0.1684	0.3069
	16.05	58.63	0.2017	1.359	1.85	0.80	0.0199	0.1532	2.2509	-0.1484	0.3170
	16.54	58.55	0.2015	1.358	1.85	0.79	0.0195	0.1518	2.2805	-0.1352	0.3234
	17.07	58.78	0.2020	1.360	1.85	0.79	0.0193	0.1504	2.2742	-0.1243	0.3325
	17.54	58.72	0.2019	1.358	1.84	0.79	0.0195	0.1506	2.2790	-0.1143	0.3396
	18.06	58.56	0.2016	1.357	1.84	0.79	0.0193	0.1499	2.2857	-0.1056	0.3443
	18.56	58.76	0.2019	1.359	1.84	0.78	0.0191	0.1489	2.2803	-0.0967	0.3461
	19.03	58.95	0.2023	1.361	1.85	0.79	0.0193	0.1498	2.2419	-0.1004	0.3489
	19.52	58.65	0.2017	1.357	1.85	0.80	0.0197	0.1528	2.1863	-0.1390	0.3698
	20.02	58.80	0.2020	1.358	1.85	0.79	0.0195	0.1517	2.1822	-0.1377	0.3833

Table B27. Aerodynamic Data Summary for Run 85 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
85 (AFC-off-R1VGs)	-3.87	59.17	0.2012	1.454	1.0	0	0	0	0.2769	-0.1857	0.1373
	0.39	59.17	0.2012	1.451	1.0	0	0	0	0.7848	-0.2208	0.1354
	2.42	59.01	0.2010	1.447	1.0	0	0	0	0.9535	-0.2054	0.1420
	4.52	58.97	0.2009	1.445	1.0	0	0	0	1.1163	-0.1847	0.1516
	6.60	59.11	0.2011	1.446	1.0	0	0	0	1.2781	-0.1654	0.1661
	7.62	58.96	0.2009	1.443	1.0	0	0	0	1.3531	-0.1538	0.1735
	8.66	59.10	0.2011	1.444	1.0	0	0	0	1.4294	-0.1424	0.1822
	9.69	59.20	0.2013	1.444	1.0	0	0	0	1.5085	-0.1324	0.1924
	10.72	59.23	0.2013	1.442	1.0	0	0	0	1.5854	-0.1211	0.2032
	11.77	59.07	0.2011	1.439	1.0	0	0	0	1.6574	-0.1066	0.2145
	12.80	58.89	0.2007	1.437	1.0	0	0	0	1.7236	-0.0932	0.2250
	13.82	59.07	0.2010	1.438	1.0	0	0	0	1.7908	-0.0792	0.2368
	14.84	59.18	0.2012	1.439	1.0	0	0	0	1.8484	-0.0669	0.2478
	15.89	58.83	0.2006	1.434	1.0	0	0	0	1.9090	-0.0521	0.2608
	16.38	58.91	0.2007	1.434	1.0	0	0	0	1.9380	-0.0448	0.2672
	16.92	59.05	0.2010	1.435	1.0	0	0	0	1.9677	-0.0365	0.2742
	17.41	59.04	0.2010	1.434	1.0	0	0	0	1.9938	-0.0285	0.2803
	17.95	59.34	0.2015	1.437	1.0	0	0	0	2.0295	-0.0206	0.3022
	18.44	59.31	0.2014	1.436	1.0	0	0	0	2.0499	-0.0136	0.3101
	18.94	59.40	0.2016	1.437	1.0	0	0	0	2.0567	-0.0076	0.3164
	19.45	59.48	0.2017	1.437	1.0	0	0	0	2.0528	-0.0045	0.3227
	19.94	59.50	0.2018	1.437	1.0	0	0	0	2.0357	-0.0152	0.3344

Table B28. Aerodynamic Data Summary for Run 86 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
86 (HELP-10C-R1S+R1VGs)	-3.77	59.14	0.2011	1.422	1.23	0.44	0.0088	0.0550	0.5095	-0.2778	0.1383
	0.49	59.11	0.2011	1.421	1.29	0.48	0.0103	0.0630	1.0146	-0.3255	0.1480
	2.55	58.87	0.2007	1.418	1.30	0.50	0.0109	0.0659	1.1886	-0.3019	0.1600
	4.60	58.98	0.2009	1.418	1.30	0.50	0.0108	0.0656	1.3355	-0.2736	0.1723
	6.69	59.08	0.2010	1.420	1.30	0.49	0.0106	0.0646	1.4711	-0.2408	0.1856
	7.69	58.92	0.2008	1.418	1.27	0.47	0.0099	0.0612	1.5220	-0.2201	0.1915
	8.74	59.04	0.2010	1.417	1.27	0.47	0.0096	0.0603	1.5961	-0.2043	0.2008
	9.78	58.90	0.2007	1.415	1.27	0.47	0.0098	0.0609	1.6673	-0.1878	0.2120
	10.79	59.04	0.2010	1.417	1.27	0.47	0.0098	0.0608	1.7301	-0.1670	0.2220
	11.83	59.02	0.2009	1.416	1.28	0.47	0.0098	0.0613	1.7988	-0.1520	0.2339
	12.86	58.84	0.2006	1.414	1.29	0.48	0.0101	0.0630	1.8637	-0.1377	0.2453
	13.88	59.29	0.2014	1.419	1.30	0.48	0.0103	0.0635	1.9270	-0.1244	0.2572
	14.92	59.17	0.2012	1.417	1.30	0.49	0.0105	0.0645	1.9874	-0.1082	0.2713
	15.95	59.20	0.2012	1.417	1.31	0.49	0.0106	0.0650	2.0427	-0.0914	0.2843
	16.44	59.16	0.2012	1.416	1.31	0.49	0.0105	0.0649	2.0670	-0.0842	0.2901
	16.98	59.10	0.2011	1.415	1.31	0.49	0.0105	0.0649	2.0959	-0.0743	0.2951
	17.46	59.16	0.2012	1.416	1.30	0.49	0.0106	0.0649	2.1193	-0.0651	0.3005
	17.98	59.40	0.2016	1.418	1.27	0.47	0.0096	0.0598	2.1265	-0.0554	0.3176
	18.48	59.28	0.2014	1.415	1.27	0.47	0.0096	0.0600	2.1374	-0.0510	0.3238
	18.99	59.29	0.2014	1.416	1.28	0.47	0.0096	0.0600	2.1362	-0.0462	0.3290
	19.45	59.24	0.2013	1.414	1.28	0.47	0.0097	0.0605	2.1068	-0.0564	0.3362
	19.97	59.41	0.2016	1.416	1.28	0.47	0.0096	0.0599	2.0897	-0.0783	0.3589

Table B29. Aerodynamic Data Summary for Run 87 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
87 (HELP-10C-R1S+R1VGs)	-3.71	59.12	0.2011	1.409	1.52	0.62	0.0162	0.0953	0.6363	-0.3213	0.1446
	0.53	58.87	0.2007	1.406	1.52	0.61	0.0160	0.0950	1.1068	-0.3514	0.1585
	2.60	59.12	0.2011	1.408	1.52	0.61	0.0160	0.0948	1.2695	-0.3319	0.1699
	4.66	58.68	0.2003	1.403	1.52	0.62	0.0161	0.0962	1.4207	-0.3101	0.1836
	6.71	58.97	0.2009	1.407	1.53	0.62	0.0162	0.0960	1.5613	-0.2805	0.1987
	7.74	59.27	0.2014	1.410	1.53	0.62	0.0160	0.0952	1.6283	-0.2644	0.2076
	8.79	58.85	0.2007	1.405	1.51	0.61	0.0161	0.0949	1.7049	-0.2475	0.2188
	9.82	59.22	0.2013	1.408	1.48	0.59	0.0150	0.0891	1.7552	-0.2216	0.2269
	10.83	58.90	0.2007	1.404	1.48	0.59	0.0150	0.0898	1.8181	-0.2018	0.2370
	11.87	58.98	0.2009	1.405	1.49	0.59	0.0150	0.0899	1.8789	-0.1836	0.2476
	12.89	59.30	0.2014	1.409	1.49	0.59	0.0149	0.0892	1.9342	-0.1647	0.2574
	13.91	59.22	0.2013	1.409	1.49	0.59	0.0150	0.0895	1.9852	-0.1488	0.2678
	14.92	59.18	0.2012	1.408	1.49	0.60	0.0152	0.0903	2.0412	-0.1301	0.2803
	15.97	59.18	0.2012	1.408	1.49	0.60	0.0151	0.0902	2.0903	-0.1126	0.2932
	16.46	59.37	0.2016	1.409	1.49	0.60	0.0151	0.0900	2.1142	-0.1048	0.2983
	17.00	59.07	0.2010	1.406	1.50	0.60	0.0152	0.0912	2.1476	-0.0932	0.3044
	17.49	59.46	0.2017	1.409	1.51	0.60	0.0152	0.0916	2.1703	-0.0864	0.3100
	18.00	58.93	0.2008	1.404	1.53	0.61	0.0157	0.0948	2.1867	-0.0835	0.3298
	18.53	59.43	0.2017	1.409	1.53	0.62	0.0160	0.0956	2.1896	-0.0781	0.3349
	18.98	59.25	0.2014	1.407	1.54	0.62	0.0162	0.0970	2.1883	-0.0739	0.3391
	19.49	59.18	0.2012	1.405	1.54	0.62	0.0160	0.0967	2.1455	-0.0889	0.3482
	19.99	59.49	0.2018	1.410	1.54	0.62	0.0161	0.0964	2.1365	-0.0982	0.3667

Table B30. Aerodynamic Data Summary for Run 88 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
88 (HELP-10C-R1S+R1VGs)	-3.66	59.20	0.2012	1.403	1.97	0.81	0.0247	0.1614	0.7710	-0.3547	0.1519
	0.58	59.11	0.2011	1.402	1.99	0.82	0.0250	0.1655	1.2050	-0.3703	0.1688
	2.63	58.87	0.2007	1.400	1.95	0.80	0.0242	0.1587	1.3543	-0.3517	0.1800
	4.70	58.94	0.2008	1.401	1.97	0.80	0.0243	0.1608	1.5118	-0.3318	0.1950
	6.75	58.90	0.2007	1.400	1.97	0.80	0.0245	0.1616	1.6557	-0.3042	0.2120
	7.79	58.95	0.2008	1.400	1.95	0.80	0.0244	0.1590	1.7265	-0.2892	0.2229
	8.83	59.31	0.2014	1.404	1.97	0.80	0.0242	0.1594	1.8050	-0.2760	0.2350
	9.87	58.88	0.2007	1.399	1.96	0.80	0.0246	0.1606	1.8680	-0.2561	0.2454
	10.86	58.73	0.2004	1.397	1.96	0.78	0.0233	0.1575	1.9316	-0.2400	0.2561
	11.92	58.85	0.2006	1.398	1.99	0.81	0.0247	0.1651	1.9997	-0.2249	0.2678
	12.94	59.09	0.2011	1.401	1.96	0.80	0.0243	0.1591	2.0392	-0.2018	0.2758
	13.95	59.25	0.2013	1.403	1.92	0.79	0.0243	0.1546	2.0853	-0.1802	0.2855
	14.99	59.17	0.2012	1.402	1.93	0.80	0.0243	0.1562	2.1401	-0.1635	0.2979
	16.01	59.11	0.2011	1.402	1.95	0.80	0.0244	0.1590	2.1871	-0.1499	0.3102
	16.50	59.20	0.2013	1.402	1.94	0.79	0.0239	0.1555	2.2050	-0.1386	0.3144
	17.05	59.17	0.2012	1.402	1.94	0.80	0.0243	0.1573	2.2423	-0.1274	0.3217
	17.52	58.98	0.2009	1.399	1.96	0.79	0.0240	0.1583	2.2477	-0.1219	0.3379
	18.04	59.52	0.2018	1.406	1.95	0.78	0.0232	0.1531	2.2523	-0.1145	0.3422
	18.56	59.43	0.2017	1.403	1.91	0.79	0.0241	0.1523	2.2494	-0.1025	0.3457
	19.02	59.47	0.2017	1.405	1.96	0.80	0.0242	0.1572	2.2443	-0.1034	0.3508
	19.51	59.56	0.2019	1.406	1.94	0.79	0.0238	0.1541	2.1908	-0.1185	0.3596
	20.01	59.52	0.2018	1.405	1.92	0.77	0.0230	0.1493	2.1806	-0.1232	0.3770

Table B31. Aerodynamic Data Summary for Run 89 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
89 (HELP-10C +R1VGs)	-3.68	59.27	0.2013	1.415	1.53	0.78	0.0174	0.1208	0.7309	-0.3379	0.1510
	0.57	59.15	0.2011	1.412	1.54	0.79	0.0177	0.1234	1.1796	-0.3573	0.1672
	2.60	58.98	0.2008	1.409	1.54	0.79	0.0176	0.1233	1.3415	-0.3402	0.1793
	4.69	59.08	0.2010	1.412	1.55	0.79	0.0178	0.1242	1.5007	-0.3207	0.1947
	6.77	58.71	0.2004	1.407	1.55	0.79	0.0178	0.1254	1.6542	-0.2971	0.2120
	7.79	59.08	0.2010	1.411	1.55	0.80	0.0180	0.1252	1.7344	-0.2863	0.2243
	8.84	58.94	0.2008	1.408	1.55	0.80	0.0181	0.1258	1.8106	-0.2729	0.2355
	9.86	58.91	0.2007	1.408	1.55	0.81	0.0187	0.1277	1.8821	-0.2590	0.2468
	10.89	59.04	0.2009	1.409	1.56	0.79	0.0178	0.1255	1.9547	-0.2454	0.2585
	11.93	59.05	0.2010	1.409	1.54	0.78	0.0174	0.1225	2.0175	-0.2301	0.2697
	12.96	59.22	0.2013	1.411	1.54	0.79	0.0176	0.1229	2.0806	-0.2164	0.2813
	13.98	59.36	0.2015	1.412	1.55	0.78	0.0173	0.1222	2.1420	-0.2013	0.2921
	15.02	59.13	0.2011	1.410	1.54	0.79	0.0177	0.1231	2.1989	-0.1850	0.3037
	16.04	59.40	0.2016	1.413	1.54	0.78	0.0174	0.1215	2.2416	-0.1699	0.3146
	16.53	59.24	0.2013	1.410	1.54	0.78	0.0175	0.1219	2.2638	-0.1607	0.3190
	17.07	58.93	0.2008	1.407	1.54	0.78	0.0175	0.1230	2.2970	-0.1488	0.3262
	18.03	59.15	0.2011	1.409	1.54	0.79	0.0177	0.1234	2.2954	-0.1372	0.3455
	18.55	59.48	0.2017	1.411	1.54	0.78	0.0172	0.1209	2.2895	-0.1291	0.3478
	19.05	59.31	0.2014	1.410	1.55	0.79	0.0175	0.1229	2.2611	-0.1307	0.3530
	19.50	59.28	0.2014	1.409	1.55	0.78	0.0173	0.1223	2.2074	-0.1614	0.3712
	20.04	59.45	0.2017	1.411	1.54	0.78	0.0174	0.1218	2.1957	-0.1680	0.3896

Table B32. Aerodynamic Data Summary for Run 90 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
90 (AFC-off, M_∞ = 0.125)	-3.87	23.58	0.1259	0.917	1.0	0	0	0	0.2817	-0.2011	0.1389
	0.38	23.43	0.1255	0.913	1.0	0	0	0	0.7767	-0.2118	0.1427
	2.44	23.47	0.1256	0.914	1.0	0	0	0	0.9496	-0.2019	0.1480
	4.52	23.39	0.1254	0.912	1.0	0	0	0	1.1129	-0.1843	0.1591
	6.60	23.52	0.1257	0.914	1.0	0	0	0	1.2647	-0.1638	0.1704
	7.61	23.46	0.1256	0.913	1.0	0	0	0	1.3405	-0.1521	0.1779
	8.64	23.59	0.1259	0.916	1.0	0	0	0	1.4204	-0.1415	0.1865
	9.69	23.51	0.1257	0.914	1.0	0	0	0	1.5017	-0.1298	0.1977
	10.72	23.48	0.1256	0.913	1.0	0	0	0	1.5786	-0.1190	0.2093
	11.74	23.49	0.1257	0.913	1.0	0	0	0	1.6453	-0.1057	0.2190
	12.77	23.48	0.1256	0.913	1.0	0	0	0	1.7102	-0.0905	0.2301
	13.82	23.54	0.1258	0.914	1.0	0	0	0	1.7783	-0.0760	0.2423
	14.85	23.43	0.1255	0.912	1.0	0	0	0	1.8384	-0.0615	0.2540
	15.88	23.53	0.1258	0.914	1.0	0	0	0	1.8964	-0.0441	0.2660
	16.36	23.51	0.1257	0.913	1.0	0	0	0	1.9240	-0.0379	0.2817
	16.90	23.55	0.1258	0.914	1.0	0	0	0	1.9502	-0.0291	0.2889
	17.40	23.57	0.1259	0.914	1.0	0	0	0	1.9805	-0.0197	0.2974
	17.90	23.50	0.1257	0.913	1.0	0	0	0	2.0086	-0.0107	0.3064
	18.43	23.51	0.1257	0.913	1.0	0	0	0	2.0260	-0.0023	0.3139
	18.91	23.52	0.1257	0.913	1.0	0	0	0	2.0373	0.0060	0.3203
	19.42	23.55	0.1258	0.913	1.0	0	0	0	2.0427	0.0121	0.3275
	19.94	23.59	0.1259	0.914	1.0	0	0	0	2.0404	0.0149	0.3356

Table B33. Aerodynamic Data Summary for Run 91 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
91 (HELP-10C, M_∞ = 0.125)	-3.72	23.59	0.1259	0.913	1.11	0.40	0.0127	0.1812	0.6128	-0.3081	0.1465
	0.52	23.39	0.1254	0.909	1.11	0.40	0.0127	0.1832	1.0781	-0.3400	0.1576
	2.58	23.47	0.1256	0.911	1.11	0.40	0.0126	0.1822	1.2467	-0.3233	0.1700
	4.65	23.39	0.1254	0.909	1.11	0.40	0.0127	0.1835	1.4116	-0.3062	0.1854
	6.73	23.49	0.1256	0.911	1.11	0.41	0.0129	0.1846	1.5639	-0.2839	0.2025
	7.75	23.60	0.1259	0.913	1.11	0.41	0.0127	0.1825	1.6364	-0.2725	0.2124
	8.79	23.49	0.1257	0.911	1.11	0.41	0.0127	0.1831	1.7202	-0.2611	0.2240
	9.82	23.53	0.1258	0.912	1.11	0.41	0.0128	0.1844	1.7874	-0.2458	0.2342
	10.85	23.39	0.1254	0.909	1.11	0.41	0.0129	0.1864	1.8582	-0.2311	0.2449
	11.89	23.70	0.1262	0.915	1.12	0.41	0.0129	0.1844	1.9194	-0.2155	0.2555
	12.92	23.47	0.1256	0.911	1.12	0.41	0.0131	0.1879	1.9846	-0.1999	0.2673
	13.92	23.57	0.1259	0.913	1.12	0.41	0.0131	0.1879	2.0415	-0.1819	0.2771
	14.98	23.56	0.1259	0.913	1.12	0.42	0.0133	0.1896	2.1080	-0.1624	0.2908
	16.00	23.55	0.1258	0.912	1.12	0.42	0.0135	0.1912	2.1457	-0.1439	0.3115
	16.49	23.53	0.1258	0.912	1.12	0.42	0.0136	0.1923	2.1705	-0.1350	0.3177
	17.03	23.52	0.1258	0.911	1.13	0.42	0.0136	0.1927	2.1937	-0.1261	0.3253
	17.51	23.55	0.1258	0.912	1.13	0.42	0.0135	0.1916	2.2138	-0.1154	0.3311
	18.00	23.54	0.1258	0.911	1.13	0.42	0.0135	0.1920	2.2231	-0.1058	0.3358
	18.52	23.54	0.1258	0.912	1.13	0.42	0.0135	0.1921	2.2280	-0.0963	0.3413
	19.03	23.58	0.1259	0.912	1.13	0.42	0.0136	0.1925	2.2144	-0.0885	0.3442
	19.49	23.71	0.1262	0.915	1.13	0.42	0.0134	0.1900	2.1809	-0.0950	0.3488
	19.98	23.70	0.1262	0.915	1.12	0.40	0.0123	0.1802	2.1295	-0.1106	0.3672

Table B34. Aerodynamic Data Summary for Run 92 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
92 (HELP-10C, M_∞ = 0.125)	-3.51	23.61	0.1260	0.913	1.49	0.76	0.0408	0.4542	1.0569	-0.4321	0.1671
	0.68	23.36	0.1253	0.908	1.47	0.75	0.0405	0.4518	1.4302	-0.4171	0.1922
	2.73	23.60	0.1259	0.912	1.48	0.75	0.0399	0.4462	1.5852	-0.4011	0.2069
	4.81	23.37	0.1253	0.908	1.48	0.76	0.0411	0.4605	1.7510	-0.3837	0.2267
	6.88	23.43	0.1255	0.909	1.47	0.75	0.0404	0.4503	1.8973	-0.3588	0.2486
	7.90	23.44	0.1255	0.909	1.48	0.75	0.0409	0.4564	1.9769	-0.3476	0.2621
	8.94	23.51	0.1257	0.911	1.47	0.75	0.0407	0.4485	2.0447	-0.3341	0.2733
	9.97	23.45	0.1256	0.909	1.48	0.75	0.0409	0.4555	2.1223	-0.3267	0.2865
	11.00	23.41	0.1254	0.909	1.48	0.76	0.0413	0.4587	2.1938	-0.3115	0.2998
	12.04	23.57	0.1259	0.911	1.48	0.75	0.0407	0.4525	2.2591	-0.2985	0.3120
	13.07	23.46	0.1256	0.909	1.48	0.75	0.0405	0.4518	2.3182	-0.2838	0.3244
	14.06	23.50	0.1257	0.910	1.47	0.75	0.0400	0.4474	2.3569	-0.2684	0.3326
	15.11	23.54	0.1258	0.911	1.48	0.75	0.0406	0.4511	2.4098	-0.2527	0.3456
	16.14	23.54	0.1258	0.911	1.48	0.75	0.0405	0.4512	2.4587	-0.2369	0.3693
	16.63	23.56	0.1258	0.911	1.49	0.76	0.0410	0.4570	2.4839	-0.2292	0.3770
	17.14	23.51	0.1257	0.910	1.47	0.75	0.0403	0.4493	2.4840	-0.2185	0.3796
	17.63	23.52	0.1257	0.910	1.47	0.74	0.0398	0.4458	2.4745	-0.2117	0.3814
	18.13	23.66	0.1261	0.913	1.48	0.74	0.0391	0.4416	2.4662	-0.2026	0.3838
	18.65	23.54	0.1258	0.911	1.49	0.76	0.0415	0.4604	2.4538	-0.1976	0.3860
	19.10	23.53	0.1258	0.910	1.48	0.75	0.0403	0.4510	2.4131	-0.1980	0.3895
	19.58	23.56	0.1259	0.911	1.48	0.75	0.0406	0.4533	2.3497	-0.2198	0.4043
	20.08	23.62	0.1260	0.912	1.48	0.75	0.0400	0.4467	2.3424	-0.2155	0.4174

Table B35. Aerodynamic Data Summary for Run 93 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
93 (AFC-off, M_∞ = 0.15)	-3.87	33.72	0.1509	1.087	1.0	0	0	0	0.2839	-0.1994	0.1396
	0.41	33.60	0.1506	1.085	1.0	0	0	0	0.7879	-0.2162	0.1414
	2.45	33.60	0.1506	1.084	1.0	0	0	0	0.9561	-0.2029	0.1465
	4.52	33.61	0.1507	1.084	1.0	0	0	0	1.1172	-0.1837	0.1553
	6.60	33.69	0.1508	1.086	1.0	0	0	0	1.2704	-0.1635	0.1687
	7.61	33.69	0.1508	1.086	1.0	0	0	0	1.3475	-0.1518	0.1765
	8.64	33.37	0.1501	1.081	1.0	0	0	0	1.4238	-0.1406	0.1851
	9.69	33.58	0.1506	1.084	1.0	0	0	0	1.5045	-0.1303	0.1951
	10.72	33.82	0.1511	1.088	1.0	0	0	0	1.5799	-0.1198	0.2062
	11.75	33.54	0.1505	1.083	1.0	0	0	0	1.6533	-0.1062	0.2168
	12.80	33.68	0.1508	1.085	1.0	0	0	0	1.7161	-0.0910	0.2275
	13.82	33.72	0.1509	1.086	1.0	0	0	0	1.7826	-0.0770	0.2392
	14.85	33.63	0.1507	1.084	1.0	0	0	0	1.8441	-0.0625	0.2511
	15.88	33.66	0.1508	1.085	1.0	0	0	0	1.9027	-0.0477	0.2633
	16.37	33.81	0.1511	1.087	1.0	0	0	0	1.9300	-0.0404	0.2694
	16.90	33.76	0.1510	1.086	1.0	0	0	0	1.9568	-0.0315	0.2761
	17.41	33.74	0.1509	1.086	1.0	0	0	0	1.9933	-0.0220	0.2958
	17.95	33.74	0.1509	1.086	1.0	0	0	0	2.0223	-0.0143	0.3042
	18.42	33.76	0.1510	1.085	1.0	0	0	0	2.0413	-0.0047	0.3118
	18.93	33.61	0.1506	1.083	1.0	0	0	0	2.0516	0.0025	0.3181
	19.43	33.84	0.1512	1.087	1.0	0	0	0	2.0541	0.0070	0.3246
	19.97	33.85	0.1512	1.087	1.0	0	0	0	2.0452	0.0051	0.3339

Table B36. Aerodynamic Data Summary for Run 94 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
94 (HELP-10C, M_∞ = 0.15)	-3.58	33.92	0.1513	1.087	1.52	0.79	0.0311	0.2824	0.9183	-0.3926	0.1603
	0.63	33.58	0.1506	1.081	1.53	0.80	0.0316	0.2890	1.3290	-0.3930	0.1816
	2.69	33.63	0.1507	1.082	1.53	0.79	0.0310	0.2864	1.4903	-0.3773	0.1961
	4.74	33.68	0.1508	1.082	1.52	0.78	0.0306	0.2816	1.6374	-0.3570	0.2119
	6.84	33.70	0.1509	1.083	1.52	0.79	0.0311	0.2852	1.7898	-0.3329	0.2319
	7.85	33.58	0.1506	1.081	1.53	0.79	0.0312	0.2874	1.8739	-0.3229	0.2455
	8.90	33.66	0.1507	1.082	1.53	0.79	0.0310	0.2856	1.9507	-0.3106	0.2579
	9.92	33.75	0.1510	1.083	1.52	0.79	0.0308	0.2826	2.0193	-0.2977	0.2691
	10.96	33.69	0.1508	1.082	1.54	0.79	0.0313	0.2899	2.1012	-0.2876	0.2831
	12.00	33.68	0.1508	1.082	1.54	0.80	0.0316	0.2907	2.1682	-0.2742	0.2954
	13.03	33.83	0.1511	1.084	1.54	0.79	0.0312	0.2876	2.2329	-0.2604	0.3078
	14.05	33.91	0.1513	1.085	1.55	0.80	0.0313	0.2887	2.2878	-0.2463	0.3187
	15.08	33.57	0.1506	1.079	1.54	0.80	0.0316	0.2921	2.3441	-0.2320	0.3318
	16.11	33.78	0.1510	1.083	1.54	0.80	0.0315	0.2890	2.3936	-0.2145	0.3444
	16.58	33.80	0.1511	1.084	1.54	0.79	0.0314	0.2889	2.4068	-0.2066	0.3600
	17.11	33.81	0.1511	1.084	1.54	0.79	0.0310	0.2868	2.4206	-0.1986	0.3657
	17.62	33.78	0.1510	1.083	1.54	0.80	0.0314	0.2898	2.4226	-0.1906	0.3697
	18.11	33.84	0.1512	1.084	1.55	0.80	0.0315	0.2902	2.4136	-0.1829	0.3711
	18.63	33.78	0.1510	1.083	1.55	0.80	0.0317	0.2922	2.4080	-0.1761	0.3748
	19.07	33.84	0.1512	1.084	1.53	0.79	0.0310	0.2850	2.3559	-0.1787	0.3764
	19.56	33.79	0.1511	1.083	1.53	0.78	0.0306	0.2833	2.2914	-0.2147	0.3984
	20.06	33.81	0.1511	1.084	1.53	0.79	0.0308	0.2844	2.2958	-0.2064	0.4089

Table B37. Aerodynamic Data Summary for Run 95 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
95 (HELP-10C, M_∞ = 0.175)	-3.63	45.68	0.1761	1.255	1.53	0.79	0.0231	0.1811	0.8090	-0.3615	0.1546
	0.59	45.39	0.1756	1.250	1.54	0.79	0.0232	0.1830	1.2374	-0.3726	0.1728
	2.65	45.49	0.1758	1.252	1.55	0.79	0.0231	0.1832	1.4023	-0.3556	0.1860
	4.72	45.72	0.1762	1.254	1.54	0.79	0.0234	0.1821	1.5574	-0.3369	0.2009
	6.78	45.62	0.1760	1.254	1.55	0.79	0.0233	0.1838	1.7114	-0.3142	0.2201
	7.82	45.52	0.1758	1.251	1.55	0.79	0.0229	0.1825	1.7935	-0.3024	0.2330
	8.86	45.57	0.1759	1.252	1.54	0.79	0.0231	0.1821	1.8707	-0.2892	0.2450
	9.91	45.59	0.1760	1.252	1.54	0.79	0.0231	0.1823	1.9414	-0.2761	0.2564
	10.92	45.70	0.1762	1.253	1.55	0.79	0.0231	0.1832	2.0163	-0.2641	0.2684
	11.96	45.78	0.1764	1.254	1.55	0.79	0.0229	0.1817	2.0797	-0.2499	0.2798
	12.99	45.69	0.1762	1.253	1.55	0.80	0.0234	0.1847	2.1466	-0.2368	0.2924
	14.01	45.44	0.1757	1.249	1.55	0.79	0.0233	0.1854	2.2132	-0.2233	0.3045
	15.03	45.88	0.1766	1.255	1.54	0.79	0.0231	0.1817	2.2614	-0.2062	0.3149
	16.07	45.59	0.1760	1.251	1.55	0.79	0.0228	0.1821	2.3153	-0.1925	0.3277
	16.57	45.74	0.1763	1.253	1.56	0.80	0.0234	0.1853	2.3486	-0.1845	0.3348
	17.10	45.71	0.1762	1.252	1.55	0.79	0.0231	0.1836	2.3488	-0.1747	0.3504
	17.57	45.71	0.1762	1.252	1.55	0.80	0.0234	0.1850	2.3548	-0.1683	0.3548
	18.10	45.61	0.1760	1.251	1.55	0.79	0.0233	0.1849	2.3583	-0.1590	0.3588
	18.58	45.69	0.1762	1.252	1.56	0.80	0.0233	0.1855	2.3495	-0.1529	0.3606
	19.07	45.73	0.1763	1.252	1.55	0.80	0.0233	0.1848	2.3095	-0.1554	0.3642
	19.52	45.81	0.1764	1.253	1.56	0.80	0.0234	0.1866	2.2572	-0.1878	0.3820
	20.06	45.97	0.1767	1.255	1.56	0.80	0.0232	0.1848	2.2411	-0.1916	0.4004

Table B38. Aerodynamic Data Summary for Run 96 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
96 (AFC-off, M_∞ = 0.175)	-3.87	45.35	0.1761	1.274	1.0	0	0	0	0.2637	-0.1826	0.1394
	0.38	45.24	0.1759	1.271	1.0	0	0	0	0.7829	-0.2200	0.1397
	2.44	45.21	0.1758	1.269	1.0	0	0	0	0.9502	-0.2048	0.1449
	4.52	45.23	0.1758	1.269	1.0	0	0	0	1.1161	-0.1870	0.1553
	6.60	45.16	0.1757	1.267	1.0	0	0	0	1.2676	-0.1650	0.1672
	7.61	45.07	0.1755	1.266	1.0	0	0	0	1.3460	-0.1545	0.1754
	8.66	45.20	0.1758	1.267	1.0	0	0	0	1.4221	-0.1420	0.1835
	9.69	45.25	0.1759	1.267	1.0	0	0	0	1.5033	-0.1326	0.1943
	10.72	45.27	0.1759	1.267	1.0	0	0	0	1.5762	-0.1201	0.2041
	11.76	45.38	0.1761	1.268	1.0	0	0	0	1.6520	-0.1081	0.2161
	12.80	45.47	0.1763	1.269	1.0	0	0	0	1.7176	-0.0934	0.2264
	13.80	45.35	0.1761	1.266	1.0	0	0	0	1.7791	-0.0792	0.2366
	14.85	45.51	0.1764	1.268	1.0	0	0	0	1.8412	-0.0651	0.2495
	15.88	45.10	0.1756	1.262	1.0	0	0	0	1.9015	-0.0514	0.2623
	16.38	45.45	0.1763	1.266	1.0	0	0	0	1.9309	-0.0426	0.2681
	16.92	45.46	0.1763	1.266	1.0	0	0	0	1.9594	-0.0341	0.2753
	17.40	45.16	0.1757	1.261	1.0	0	0	0	1.9868	-0.0252	0.2814
	17.93	45.26	0.1759	1.263	1.0	0	0	0	2.0215	-0.0182	0.3023
	18.42	45.17	0.1757	1.260	1.0	0	0	0	2.0432	-0.0099	0.3102
	18.95	45.45	0.1763	1.264	1.0	0	0	0	2.0556	-0.0026	0.3179
	19.43	45.45	0.1763	1.264	1.0	0	0	0	2.0571	0.0020	0.3236
	19.93	45.42	0.1762	1.263	1.0	0	0	0	2.0443	-0.0039	0.3318

Table B39. Aerodynamic Data Summary for Run 97 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
97 (HELP-10C, M_∞ = 0.175)	-3.70	45.49	0.1764	1.255	1.27	0.60	0.0137	0.1133	0.6517	-0.3233	0.1468
	0.53	45.21	0.1759	1.251	1.27	0.60	0.0137	0.1140	1.1085	-0.3486	0.1593
	2.59	44.70	0.1749	1.243	1.27	0.60	0.0139	0.1161	1.2814	-0.3320	0.1731
	4.67	45.04	0.1755	1.248	1.26	0.59	0.0136	0.1132	1.4398	-0.3132	0.1868
	6.74	45.00	0.1755	1.247	1.25	0.58	0.0129	0.1092	1.5850	-0.2862	0.2032
	7.75	45.10	0.1757	1.249	1.24	0.57	0.0127	0.1077	1.6554	-0.2733	0.2127
	8.80	45.20	0.1759	1.250	1.24	0.57	0.0127	0.1074	1.7338	-0.2616	0.2243
	9.82	45.38	0.1762	1.252	1.24	0.57	0.0126	0.1067	1.8030	-0.2455	0.2346
	10.85	45.17	0.1758	1.249	1.25	0.57	0.0126	0.1075	1.8707	-0.2325	0.2451
	11.89	45.15	0.1758	1.249	1.25	0.57	0.0126	0.1073	1.9365	-0.2163	0.2560
	12.92	45.44	0.1763	1.252	1.25	0.57	0.0126	0.1068	1.9936	-0.1992	0.2662
	13.94	45.43	0.1763	1.252	1.25	0.57	0.0124	0.1064	2.0521	-0.1803	0.2773
	14.98	45.17	0.1758	1.248	1.25	0.57	0.0126	0.1076	2.1216	-0.1625	0.2909
	16.00	45.43	0.1763	1.252	1.26	0.57	0.0126	0.1076	2.1700	-0.1456	0.3028
	16.50	45.28	0.1760	1.250	1.26	0.58	0.0129	0.1099	2.1997	-0.1380	0.3088
	17.02	45.19	0.1758	1.249	1.27	0.58	0.0132	0.1118	2.2306	-0.1291	0.3154
	17.52	45.30	0.1760	1.249	1.27	0.58	0.0132	0.1122	2.2367	-0.1219	0.3321
	18.05	45.24	0.1759	1.248	1.28	0.59	0.0135	0.1140	2.2474	-0.1147	0.3374
	18.53	45.56	0.1766	1.252	1.28	0.59	0.0134	0.1126	2.2482	-0.1063	0.3413
	19.02	45.48	0.1764	1.251	1.28	0.59	0.0135	0.1137	2.2305	-0.1024	0.3438
	19.48	45.48	0.1764	1.250	1.28	0.58	0.0132	0.1120	2.1720	-0.1358	0.3626
	20.02	45.65	0.1767	1.253	1.28	0.59	0.0133	0.1124	2.1589	-0.1424	0.3801

Table B40. Aerodynamic Data Summary for Run 98 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
98 (HELP-10C)	-3.79	58.86	0.2014	1.413	1.12	0.43	0.0059	0.0491	0.4439	-0.2576	0.1331
	0.44	58.57	0.2008	1.408	1.12	0.43	0.0059	0.0494	0.9113	-0.2827	0.1345
	2.51	58.70	0.2011	1.409	1.12	0.43	0.0058	0.0490	1.0901	-0.2683	0.1463
	4.58	58.44	0.2006	1.407	1.12	0.43	0.0058	0.0493	1.2581	-0.2470	0.1604
	6.66	58.49	0.2007	1.408	1.12	0.42	0.0057	0.0483	1.4000	-0.2177	0.1739
	7.67	58.54	0.2008	1.408	1.11	0.41	0.0053	0.0463	1.4675	-0.2030	0.1813
	8.72	58.37	0.2005	1.406	1.11	0.41	0.0054	0.0471	1.5450	-0.1919	0.1915
	9.74	58.63	0.2010	1.409	1.11	0.41	0.0054	0.0468	1.6216	-0.1787	0.2021
	10.77	58.44	0.2006	1.406	1.12	0.41	0.0054	0.0470	1.6930	-0.1635	0.2133
	11.82	58.76	0.2012	1.410	1.12	0.41	0.0053	0.0464	1.7643	-0.1465	0.2253
	12.85	58.68	0.2010	1.408	1.12	0.41	0.0054	0.0470	1.8320	-0.1324	0.2372
	13.87	58.80	0.2013	1.409	1.13	0.42	0.0056	0.0481	1.8998	-0.1180	0.2500
	14.91	58.56	0.2008	1.406	1.13	0.43	0.0057	0.0493	1.9661	-0.1032	0.2626
	15.94	58.75	0.2012	1.408	1.14	0.43	0.0060	0.0503	2.0244	-0.0887	0.2758
	16.43	58.96	0.2016	1.411	1.14	0.44	0.0059	0.0502	2.0489	-0.0812	0.2811
	16.95	58.95	0.2015	1.410	1.14	0.43	0.0059	0.0502	2.0779	-0.0715	0.2875
	17.46	58.64	0.2010	1.407	1.14	0.44	0.0060	0.0507	2.1088	-0.0612	0.2946
	17.99	58.65	0.2010	1.406	1.13	0.43	0.0059	0.0499	2.1215	-0.0528	0.3129
	18.48	58.87	0.2014	1.408	1.12	0.41	0.0054	0.0470	2.1244	-0.0423	0.3175
	18.99	59.05	0.2017	1.410	1.12	0.41	0.0053	0.0468	2.1258	-0.0379	0.3235
	19.45	59.01	0.2017	1.409	1.12	0.41	0.0053	0.0470	2.0927	-0.0457	0.3289
	19.98	59.03	0.2017	1.409	1.12	0.41	0.0053	0.0467	2.0609	-0.0797	0.3567

Table B41. Aerodynamic Data Summary for Run 101 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
	-3.60	58.58	0.2011	1.418	1.92	1.05	0.0315	0.2050	0.8679	-0.3774	0.1575
	0.61	58.35	0.2007	1.407	2.09	1.16	0.0351	0.2481	1.3170	-0.3955	0.1808
	2.68	58.32	0.2007	1.407	2.08	1.16	0.0351	0.2484	1.4771	-0.3794	0.1950
	4.75	58.46	0.2009	1.402	2.07	1.15	0.0344	0.2436	1.6342	-0.3589	0.2109
	6.81	58.10	0.2003	1.397	2.08	1.16	0.0352	0.2505	1.7862	-0.3372	0.2316
	7.86	58.40	0.2008	1.400	2.01	1.16	0.0362	0.2387	1.8564	-0.3225	0.2427
	8.88	58.36	0.2007	1.393	1.94	1.08	0.0323	0.2148	1.9202	-0.3058	0.2531
	9.93	58.33	0.2007	1.392	1.94	1.08	0.0325	0.2158	1.9914	-0.2938	0.2657
	10.94	58.21	0.2005	1.391	1.94	1.08	0.0326	0.2166	2.0614	-0.2823	0.2770
101	11.98	58.54	0.2011	1.395	1.93	1.07	0.0318	0.2104	2.1287	-0.2679	0.2890
	13.03	58.71	0.2014	1.394	2.01	1.11	0.0330	0.2278	2.2128	-0.2590	0.3050
(HELP-10C^)	14.04	58.36	0.2008	1.389	2.04	1.13	0.0338	0.2372	2.2823	-0.2489	0.3181
	15.06	58.60	0.2012	1.392	2.06	1.14	0.0343	0.2414	2.3347	-0.2355	0.3297
	16.11	58.69	0.2014	1.393	2.10	1.16	0.0346	0.2491	2.4034	-0.2206	0.3447
	16.59	58.46	0.2009	1.390	2.03	1.16	0.0358	0.2419	2.4143	-0.2080	0.3474
	17.13	58.39	0.2008	1.387	2.10	1.16	0.0349	0.2511	2.4162	-0.2065	0.3632
	17.60	58.77	0.2015	1.391	1.92	1.01	0.0286	0.1992	2.3859	-0.1871	0.3605
	18.09	58.62	0.2012	1.389	1.96	1.08	0.0320	0.2174	2.3895	-0.1824	0.3648
	18.59	58.72	0.2014	1.390	1.95	1.09	0.0327	0.2169	2.3751	-0.1751	0.3657
	19.06	58.64	0.2012	1.388	1.94	1.07	0.0319	0.2131	2.3201	-0.1818	0.3699
	19.57	58.65	0.2013	1.388	1.94	1.07	0.0318	0.2134	2.2718	-0.2108	0.3912
	20.05	58.91	0.2017	1.391	2.00	1.10	0.0322	0.2240	2.2747	-0.2151	0.4074

Table B42. Aerodynamic Data Summary for Run 102 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
	-3.67	58.40	0.2009	1.375	1.50	0.644	0.0127	0.0997	0.7227	-0.3385	0.1518
	0.57	58.63	0.2013	1.373	1.59	0.707	0.0151	0.1154	1.1876	-0.3654	0.1690
	0.57	58.44	0.2009	1.370	1.59	0.706	0.0151	0.1160	1.1873	-0.3661	0.1685
	2.62	58.58	0.2012	1.370	1.53	0.665	0.0135	0.1048	1.3345	-0.3452	0.1815
	4.72	58.40	0.2008	1.365	1.61	0.714	0.0154	0.1190	1.5205	-0.3334	0.2007
	6.78	58.29	0.2007	1.364	1.62	0.719	0.0156	0.1208	1.6691	-0.3115	0.2178
	7.78	58.51	0.2010	1.366	1.49	0.721	0.0159	0.1112	1.7144	-0.2924	0.2238
	7.77	58.36	0.2008	1.364	1.44	0.618	0.0119	0.0926	1.6996	-0.2896	0.2217
	8.85	58.53	0.2011	1.364	1.66	0.74	0.0162	0.1270	1.8417	-0.2910	0.2431
	9.88	58.70	0.2014	1.362	1.55	0.701	0.0149	0.1119	1.8835	-0.2697	0.2474
102	10.91	58.46	0.2010	1.358	1.57	0.715	0.0155	0.1161	1.9593	-0.2577	0.2629
	11.92	58.43	0.2009	1.358	1.46	0.647	0.0130	0.0982	1.9882	-0.2340	0.2672
(HELP-10C^)	12.95	58.86	0.2017	1.362	1.46	0.664	0.0136	0.0999	2.0534	-0.2195	0.2773
	13.97	58.65	0.2013	1.359	1.47	0.653	0.0132	0.0989	2.1173	-0.2058	0.2899
	15.01	58.44	0.2009	1.356	1.48	0.653	0.0132	0.1004	2.1815	-0.1907	0.3021
	16.04	58.74	0.2015	1.360	1.57	0.716	0.0156	0.1160	2.2575	-0.1844	0.3182
	16.52	58.74	0.2015	1.359	1.47	0.652	0.0131	0.0989	2.2534	-0.1637	0.3176
	17.06	58.63	0.2013	1.357	1.47	0.655	0.0133	0.0996	2.2576	-0.1552	0.3326
	17.55	58.55	0.2011	1.354	1.58	0.714	0.0155	0.1168	2.3034	-0.1595	0.3438
	18.06	58.59	0.2012	1.355	1.58	0.717	0.0156	0.1173	2.3074	-0.1520	0.3479
	18.54	58.83	0.2016	1.357	1.47	0.655	0.0132	0.0995	2.2690	-0.1310	0.3448
	19.04	58.64	0.2013	1.356	1.48	0.656	0.0133	0.1002	2.2418	-0.1295	0.3494
	19.51	58.65	0.2013	1.355	1.48	0.658	0.0133	0.1007	2.1827	-0.1644	0.3680
	20.02	58.91	0.2018	1.358	1.58	0.719	0.0155	0.1173	2.1953	-0.1796	0.3883

Table B43. Aerodynamic Data Summary for Run 103 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
103 (HELP-10C^)	-3.55	58.46	0.2010	1.344	2.32	1.30	0.0395	0.3122	0.9705	-0.4130	0.1586
	0.60	58.58	0.2012	1.345	2.27	1.27	0.0388	0.2983	1.3494	-0.4078	0.1815
	2.70	58.18	0.2005	1.340	2.27	1.26	0.0387	0.3009	1.5161	-0.3924	0.1999
	4.77	58.41	0.2009	1.341	2.29	1.27	0.0387	0.3025	1.6742	-0.3735	0.2173
	6.83	58.16	0.2005	1.338	2.29	1.27	0.0391	0.3055	1.8291	-0.3527	0.2384
	7.87	58.39	0.2009	1.341	2.32	1.28	0.0387	0.3089	1.9142	-0.3440	0.2517
	8.92	58.31	0.2008	1.339	2.32	1.29	0.0391	0.3131	1.9948	-0.3324	0.2655
	9.95	58.36	0.2009	1.339	2.45	1.39	0.0425	0.3550	2.0965	-0.3312	0.2815
	10.99	58.25	0.2007	1.338	2.46	1.38	0.0424	0.3561	2.1703	-0.3197	0.2961
	12.03	58.55	0.2012	1.341	2.45	1.38	0.0422	0.3530	2.2375	-0.3059	0.3077
	13.06	58.53	0.2012	1.340	2.47	1.40	0.0429	0.3598	2.3050	-0.2922	0.3216
	14.08	58.15	0.2005	1.335	2.47	1.40	0.0429	0.3630	2.3602	-0.2797	0.3323
	15.11	58.54	0.2012	1.340	2.45	1.40	0.0430	0.3557	2.4070	-0.2652	0.3433
	16.13	58.80	0.2017	1.343	2.29	1.29	0.0390	0.3061	2.4406	-0.2371	0.3518
	16.62	58.80	0.2016	1.343	2.30	1.29	0.0391	0.3069	2.4576	-0.2296	0.3572
	17.15	58.58	0.2013	1.339	2.35	1.28	0.0377	0.3118	2.4583	-0.2270	0.3702

Table B44. Aerodynamic Data Summary for Run 104 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
104 (HELP-10C^)	0.54	58.06	0.2007	1.365	1.55	0.714	0.0155	0.1150	1.1718	-0.3656	0.1603
	4.68	58.19	0.2009	1.366	1.48	0.664	0.0136	0.1022	1.4789	-0.3272	0.1908
	8.83	57.88	0.2003	1.362	1.55	0.706	0.0152	0.1143	1.8115	-0.2862	0.2352
	12.96	58.26	0.2010	1.366	1.49	0.665	0.0136	0.1028	2.0668	-0.2269	0.2779
	17.07	58.32	0.2011	1.365	1.55	0.705	0.0151	0.1130	2.3027	-0.1666	0.3256

Table B45. Aerodynamic Data Summary for Run 106 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
	-3.68	58.72	0.2012	1.463	1.46	0.677	0.0135	0.0987	0.6988	-0.3334	0.1474
	0.53	58.43	0.2007	1.458	1.46	0.677	0.0136	0.0997	1.1452	-0.3570	0.1621
	2.62	58.55	0.2009	1.457	1.52	0.719	0.0152	0.1104	1.3336	-0.3411	0.1769
	4.70	58.53	0.2009	1.456	1.46	0.67	0.0133	0.0985	1.4772	-0.3203	0.1904
	6.76	58.22	0.2003	1.451	1.46	0.665	0.0132	0.0987	1.6307	-0.2980	0.2083
	7.76	58.58	0.2009	1.454	1.52	0.71	0.0148	0.1090	1.7239	-0.2903	0.2212
	8.82	58.81	0.2013	1.456	1.46	0.667	0.0132	0.0979	1.7863	-0.2731	0.2306
	9.85	58.35	0.2005	1.450	1.47	0.668	0.0134	0.0993	1.8607	-0.2590	0.2423
	10.89	58.47	0.2007	1.449	1.51	0.699	0.0145	0.1071	1.9443	-0.2498	0.2552
106	11.90	58.31	0.2005	1.446	1.45	0.649	0.0127	0.0958	1.9900	-0.2308	0.2631
	12.95	58.52	0.2008	1.448	1.46	0.651	0.0128	0.0960	2.0559	-0.2154	0.2755
(HELP-10C^)	13.98	58.47	0.2007	1.446	1.51	0.692	0.0144	0.1061	2.1383	-0.2065	0.2899
	14.98	58.66	0.2011	1.447	1.45	0.642	0.0125	0.0941	2.1775	-0.1839	0.2979
	16.03	58.79	0.2013	1.448	1.46	0.642	0.0125	0.0940	2.2249	-0.1686	0.3102
	16.53	58.78	0.2013	1.447	1.51	0.684	0.0141	0.1040	2.2649	-0.1658	0.3182
	17.06	58.61	0.2010	1.445	1.46	0.641	0.0125	0.0946	2.2816	-0.1485	0.3223
	17.56	58.71	0.2012	1.445	1.46	0.643	0.0126	0.0948	2.2929	-0.1396	0.3264
	18.05	58.84	0.2014	1.444	1.51	0.676	0.0138	0.1029	2.2973	-0.1414	0.3438
	18.57	58.54	0.2009	1.440	1.45	0.632	0.0123	0.0931	2.2794	-0.1242	0.3445
	19.03	58.73	0.2012	1.441	1.46	0.634	0.0123	0.0932	2.2570	-0.1224	0.3472
	19.52	58.76	0.2013	1.441	1.51	0.675	0.0138	0.1032	2.2032	-0.1632	0.3678
	20.00	58.55	0.2009	1.437	1.45	0.632	0.0123	0.0933	2.1799	-0.1598	0.3813

Table B46. Aerodynamic Data Summary for Run 107 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
	-3.73	58.70	0.2011	1.419	1.24	0.511	0.0083	0.0644	0.5734	-0.2955	0.1395
	0.48	58.67	0.2011	1.416	1.24	0.507	0.0082	0.0638	1.0284	-0.3206	0.1477
	2.57	58.32	0.2005	1.411	1.27	0.533	0.0091	0.0696	1.2317	-0.3131	0.1645
	4.63	58.50	0.2008	1.411	1.24	0.503	0.0081	0.0636	1.3705	-0.2850	0.1759
	6.71	58.45	0.2007	1.411	1.24	0.505	0.0082	0.0642	1.5255	-0.2637	0.1928
	7.74	58.44	0.2007	1.409	1.27	0.528	0.0089	0.0689	1.6191	-0.2610	0.2052
	8.75	58.51	0.2008	1.408	1.24	0.503	0.0082	0.0640	1.6802	-0.2417	0.2124
	9.80	58.63	0.2010	1.409	1.25	0.506	0.0082	0.0643	1.7528	-0.2279	0.2238
	10.84	58.69	0.2011	1.409	1.28	0.531	0.0090	0.0692	1.8441	-0.2217	0.2391
107	11.87	58.45	0.2007	1.406	1.25	0.503	0.0082	0.0642	1.8867	-0.1961	0.2458
	12.88	58.42	0.2007	1.404	1.25	0.503	0.0082	0.0644	1.9491	-0.1802	0.2559
(HELP-10C^)	13.93	58.60	0.2010	1.406	1.28	0.531	0.0090	0.0696	2.0302	-0.1726	0.2714
	14.94	58.65	0.2011	1.405	1.25	0.503	0.0081	0.0641	2.0691	-0.1447	0.2793
	15.98	58.70	0.2011	1.406	1.25	0.506	0.0082	0.0645	2.1216	-0.1274	0.2928
	16.48	58.75	0.2012	1.406	1.29	0.533	0.0090	0.0698	2.1626	-0.1274	0.3014
	17.03	58.50	0.2008	1.401	1.28	0.531	0.0090	0.0700	2.2005	-0.1155	0.3086
	17.51	58.66	0.2011	1.402	1.25	0.501	0.0080	0.0640	2.1827	-0.0977	0.3203
	18.01	58.57	0.2009	1.400	1.29	0.533	0.0090	0.0703	2.2168	-0.1006	0.3301
	18.53	58.87	0.2014	1.403	1.25	0.505	0.0081	0.0644	2.1990	-0.0835	0.3311
	19.00	58.84	0.2014	1.402	1.27	0.506	0.0081	0.0652	2.1970	-0.0817	0.3364
	19.47	58.89	0.2015	1.403	1.29	0.534	0.0090	0.0701	2.1491	-0.1174	0.3524
	20.00	58.71	0.2012	1.400	1.26	0.508	0.0082	0.0653	2.1193	-0.1219	0.3691

Table B47. Aerodynamic Data Summary for Run 108 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
108 (HELP-10C^)	-3.80	58.69	0.2011	1.394	1.11	0.367	0.0044	0.0417	0.4315	-0.2455	0.1315
	0.40	58.64	0.2010	1.392	1.11	0.367	0.0044	0.0418	0.8943	-0.2710	0.1314
	2.50	58.54	0.2009	1.390	1.11	0.366	0.0044	0.0418	1.0784	-0.2573	0.1433
	4.58	58.46	0.2007	1.388	1.11	0.366	0.0044	0.0419	1.2461	-0.2364	0.1576
	6.66	58.59	0.2010	1.390	1.11	0.367	0.0044	0.0420	1.3989	-0.2126	0.1730
	7.65	58.62	0.2010	1.390	1.12	0.367	0.0044	0.0420	1.4708	-0.2020	0.1808
	8.72	58.35	0.2005	1.385	1.12	0.367	0.0045	0.0424	1.5523	-0.1902	0.1915
	9.72	58.44	0.2007	1.386	1.12	0.368	0.0045	0.0424	1.6276	-0.1776	0.2023
	10.78	58.54	0.2009	1.387	1.12	0.366	0.0044	0.0421	1.6982	-0.1624	0.2136
	11.81	58.57	0.2009	1.387	1.11	0.346	0.0040	0.0394	1.7541	-0.1401	0.2231
	12.82	58.64	0.2010	1.385	1.12	0.357	0.0042	0.0409	1.8281	-0.1290	0.2352
	13.87	58.71	0.2012	1.386	1.13	0.378	0.0047	0.0438	1.9063	-0.1196	0.2496
	14.89	58.78	0.2013	1.386	1.11	0.353	0.0041	0.0402	1.9533	-0.0948	0.2596
	15.91	58.82	0.2014	1.386	1.12	0.354	0.0041	0.0404	2.0107	-0.0805	0.2727
	16.43	58.70	0.2011	1.384	1.13	0.378	0.0047	0.0439	2.0512	-0.0773	0.2808
	16.97	58.50	0.2008	1.381	1.12	0.355	0.0042	0.0409	2.0696	-0.0621	0.2855
	17.46	58.90	0.2015	1.385	1.13	0.378	0.0047	0.0438	2.1070	-0.0583	0.2938
	17.95	58.76	0.2013	1.383	1.12	0.356	0.0042	0.0408	2.1134	-0.0481	0.3103
	18.50	58.66	0.2011	1.382	1.12	0.357	0.0042	0.0411	2.1259	-0.0411	0.3174
	18.97	59.00	0.2017	1.386	1.14	0.378	0.0047	0.0438	2.1318	-0.0414	0.3228
	19.46	58.67	0.2011	1.381	1.12	0.355	0.0042	0.0409	2.0924	-0.0443	0.3292
	19.96	58.86	0.2014	1.383	1.14	0.38	0.0047	0.0442	2.0703	-0.0847	0.3567

Table B48. Aerodynamic Data Summary for Run 109 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
109 (HELP-10C^)	-3.53	58.60	0.2010	1.373	2.50	1.39	0.0419	0.3577	1.0186	-0.4239	0.1600
	0.67	58.31	0.2005	1.369	2.52	1.41	0.0431	0.3687	1.4089	-0.4160	0.1841
	2.72	58.48	0.2008	1.371	2.40	1.33	0.0400	0.3295	1.5487	-0.3940	0.1987
	4.80	58.42	0.2007	1.369	2.53	1.42	0.0435	0.3722	1.7316	-0.3816	0.2192
	6.85	58.65	0.2011	1.372	2.41	1.33	0.0401	0.3313	1.8601	-0.3530	0.2381
	7.89	58.56	0.2009	1.370	2.53	1.42	0.0433	0.3711	1.9627	-0.3479	0.2545
	8.93	58.54	0.2009	1.370	2.41	1.33	0.0401	0.3314	2.0186	-0.3311	0.2649
	9.93	58.41	0.2007	1.368	2.42	1.34	0.0404	0.3359	2.0950	-0.3209	0.2783
	11.00	58.66	0.2011	1.371	2.54	1.42	0.0433	0.3727	2.1924	-0.3161	0.2950
	12.03	58.71	0.2012	1.371	2.41	1.33	0.0399	0.3309	2.2373	-0.2948	0.3046
	13.04	58.28	0.2004	1.366	2.42	1.34	0.0406	0.3378	2.3068	-0.2828	0.3179
	14.09	58.75	0.2013	1.371	2.54	1.44	0.0437	0.3754	2.3832	-0.2762	0.3332
	15.11	58.46	0.2007	1.368	2.42	1.35	0.0406	0.3372	2.4121	-0.2557	0.3421
	16.12	58.66	0.2011	1.370	2.43	1.35	0.0405	0.3372	2.4760	-0.2365	0.3561
	16.64	58.87	0.2015	1.372	2.54	1.43	0.0430	0.3720	2.5155	-0.2367	0.3651
	17.15	58.81	0.2014	1.371	2.42	1.34	0.0400	0.3337	2.4791	-0.2239	0.3736
	17.63	58.35	0.2006	1.365	2.42	1.35	0.0404	0.3387	2.4812	-0.2190	0.3773
	18.14	58.79	0.2013	1.370	2.53	1.43	0.0433	0.3720	2.4807	-0.2176	0.3807
	18.64	58.87	0.2015	1.371	2.42	1.35	0.0402	0.3337	2.4424	-0.2039	0.3787
	19.09	58.83	0.2014	1.370	2.54	1.43	0.0431	0.3716	2.3939	-0.2256	0.3861
	19.58	58.92	0.2016	1.371	2.41	1.34	0.0398	0.3310	2.3366	-0.2398	0.4029
	20.08	58.92	0.2016	1.370	2.46	1.37	0.0409	0.3458	2.3472	-0.2330	0.4153

Table B49. Aerodynamic Data Summary for Run 110 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
110 HELP-10C^)	-3.60	58.58	0.2010	1.364	2.08	1.13	0.0333	0.2434	0.9122	-0.3873	0.1566
	0.62	58.42	0.2007	1.362	1.99	1.08	0.0320	0.2229	1.2960	-0.3850	0.1755
	2.69	58.65	0.2011	1.364	2.09	1.14	0.0335	0.2453	1.4846	-0.3739	0.1923
	4.75	58.66	0.2011	1.364	2.00	1.09	0.0320	0.2236	1.6214	-0.3515	0.2072
	6.83	58.44	0.2007	1.362	2.00	1.09	0.0324	0.2268	1.7736	-0.3275	0.2274
	7.85	58.61	0.2010	1.364	2.10	1.14	0.0338	0.2477	1.8767	-0.3227	0.2434
	8.87	58.61	0.2010	1.363	2.00	1.09	0.0319	0.2248	1.9334	-0.3060	0.2525
	9.92	58.67	0.2011	1.364	2.01	1.10	0.0322	0.2274	2.0101	-0.2944	0.2654
	10.95	58.62	0.2011	1.363	2.02	1.11	0.0327	0.2311	2.0839	-0.2819	0.2787
	11.97	58.51	0.2009	1.361	2.02	1.11	0.0328	0.2323	2.1540	-0.2692	0.2908
	13.02	58.56	0.2009	1.362	2.02	1.11	0.0327	0.2321	2.2178	-0.2559	0.3037
	14.04	58.40	0.2007	1.360	2.03	1.11	0.0328	0.2344	2.2825	-0.2436	0.3159
	15.06	58.81	0.2014	1.364	2.03	1.12	0.0331	0.2333	2.3293	-0.2286	0.3267
	16.11	58.61	0.2010	1.362	2.06	1.12	0.0328	0.2388	2.4007	-0.2139	0.3427
	16.60	58.94	0.2016	1.366	2.10	1.15	0.0335	0.2465	2.4299	-0.2065	0.3492
	17.12	58.56	0.2010	1.361	2.00	1.10	0.0324	0.2279	2.4012	-0.1939	0.3595
	17.59	58.78	0.2013	1.364	2.01	1.10	0.0323	0.2276	2.4039	-0.1864	0.3623
	18.11	58.57	0.2010	1.361	2.08	1.13	0.0330	0.2436	2.4140	-0.1858	0.3680
	18.60	58.66	0.2011	1.362	2.03	1.14	0.0341	0.2380	2.3879	-0.1760	0.3674
	19.06	58.66	0.2011	1.362	1.98	1.09	0.0320	0.2233	2.3332	-0.1772	0.3693
	19.56	58.88	0.2015	1.364	2.11	1.16	0.0342	0.2516	2.2920	-0.2171	0.3924
	20.05	58.82	0.2014	1.363	2.00	1.09	0.0320	0.2255	2.2762	-0.2130	0.4070

Table B50. Aerodynamic Data Summary for Run 111 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
111 (HELP-8C^)	0.56	58.64	0.2011	1.361	2.03	0.90	0.0258	0.1884	1.2227	-0.3225	0.1729
	4.72	58.90	0.2016	1.364	2.12	0.95	0.0275	0.2059	1.5624	-0.2917	0.2044
	8.86	58.23	0.2004	1.356	2.02	0.89	0.0258	0.1875	1.8663	-0.2462	0.2483
	13.00	58.70	0.2012	1.361	2.14	0.95	0.0273	0.2088	2.1754	-0.2023	0.3019
	17.07	58.59	0.2010	1.359	2.03	0.90	0.0259	0.1889	2.3423	-0.1363	0.3541

Table B51. Aerodynamic Data Summary for Run 113 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
113 (HELP-8C^)	-3.59	59.33	0.2010	1.487	2.43	1.12	0.0322	0.2701	0.8912	-0.3367	0.1628
	0.58	59.14	0.2007	1.482	2.52	1.14	0.0321	0.2859	1.3090	-0.3408	0.1835
	2.67	59.17	0.2007	1.482	2.43	1.12	0.0322	0.2701	1.4588	-0.3219	0.1974
	4.75	59.11	0.2006	1.477	2.47	1.14	0.0334	0.2819	1.6254	-0.3053	0.2157
	6.82	59.30	0.2009	1.478	2.41	1.09	0.0308	0.2607	1.7671	-0.2810	0.2350
	7.84	58.83	0.2001	1.472	2.42	1.09	0.0312	0.2650	1.8518	-0.2708	0.2480
	8.90	58.94	0.2003	1.465	2.52	1.13	0.0319	0.2852	1.9529	-0.2633	0.2641
	9.92	59.69	0.2016	1.473	2.44	1.11	0.0312	0.2662	2.0092	-0.2510	0.2740
	10.95	59.27	0.2009	1.467	2.44	1.11	0.0315	0.2685	2.0843	-0.2384	0.2876
	11.99	59.49	0.2013	1.469	2.42	1.09	0.0307	0.2621	2.1542	-0.2252	0.3003
	13.02	58.99	0.2004	1.460	2.43	1.10	0.0314	0.2686	2.2261	-0.2123	0.3139
	14.06	58.82	0.2001	1.458	2.44	1.10	0.0315	0.2714	2.2846	-0.1995	0.3261
	15.07	59.61	0.2015	1.467	2.45	1.11	0.0314	0.2688	2.3305	-0.1845	0.3369
	16.11	59.17	0.2007	1.462	2.46	1.12	0.0318	0.2750	2.3829	-0.1676	0.3490
	16.60	59.19	0.2008	1.462	2.48	1.12	0.0318	0.2774	2.4203	-0.1580	0.3577
	17.13	59.09	0.2006	1.457	2.39	1.07	0.0303	0.2567	2.4199	-0.1470	0.3593
	17.61	59.39	0.2011	1.460	2.51	1.11	0.0308	0.2785	2.4093	-0.1456	0.3731
	18.10	59.16	0.2007	1.457	2.51	1.12	0.0316	0.2835	2.4034	-0.1404	0.3752
	18.59	59.59	0.2015	1.461	2.40	1.11	0.0321	0.2651	2.3741	-0.1308	0.3738
	18.59	59.59	0.2015	1.461	2.42	1.09	0.0309	0.2621	2.3742	-0.1304	0.3735
	19.08	59.22	0.2008	1.457	2.42	1.10	0.0312	0.2658	2.3236	-0.1372	0.3768

Table B52. Aerodynamic Data Summary for Run 114 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
114 (HELP-8C-ST^)	-3.62	59.55	0.2014	1.453	2.30	1.02	0.0336	0.2319	0.8694	-0.3247	0.1629
	0.62	59.14	0.2007	1.446	2.41	1.07	0.0300	0.2584	1.3015	-0.3312	0.1841
	2.67	58.80	0.2001	1.442	2.29	1.01	0.0284	0.2351	1.4436	-0.3122	0.1969
	4.74	58.94	0.2003	1.442	2.30	1.02	0.0285	0.2362	1.6007	-0.2935	0.2142
	6.80	59.48	0.2013	1.448	2.33	1.02	0.0279	0.2367	1.7560	-0.2718	0.2343
	7.86	59.52	0.2014	1.447	2.41	1.06	0.0296	0.2553	1.8549	-0.2651	0.2498
	8.91	58.97	0.2004	1.439	2.30	1.02	0.0285	0.2370	1.9218	-0.2520	0.2610
	9.91	59.48	0.2013	1.445	2.31	1.02	0.0284	0.2359	1.9945	-0.2417	0.2735
	10.96	59.37	0.2011	1.444	2.31	1.02	0.0285	0.2371	2.0695	-0.2300	0.2871
	11.99	59.78	0.2018	1.447	2.40	1.06	0.0293	0.2519	2.1523	-0.2182	0.3018
	13.02	59.82	0.2019	1.446	2.30	1.02	0.0280	0.2323	2.2030	-0.2018	0.3118
	14.05	59.41	0.2012	1.441	2.31	1.02	0.0285	0.2364	2.2652	-0.1886	0.3247
	15.07	59.48	0.2013	1.441	2.35	1.03	0.0283	0.2415	2.3159	-0.1741	0.3358
	16.12	59.18	0.2008	1.439	2.41	1.07	0.0301	0.2597	2.3827	-0.1580	0.3512
	16.11	59.24	0.2009	1.437	2.32	1.03	0.0288	0.2404	2.3656	-0.1550	0.3476
	16.59	59.12	0.2007	1.436	2.41	1.06	0.0291	0.2573	2.4121	-0.1481	0.3578
	17.12	59.33	0.2010	1.436	2.30	1.02	0.0283	0.2355	2.4058	-0.1355	0.3580
	17.60	59.42	0.2012	1.437	2.31	1.02	0.0283	0.2359	2.3859	-0.1305	0.3701
	18.09	59.16	0.2007	1.433	2.37	1.03	0.0283	0.2471	2.3900	-0.1267	0.3740
	18.59	59.41	0.2012	1.437	2.42	1.07	0.0296	0.2587	2.3737	-0.1221	0.3747
	19.09	59.60	0.2015	1.438	2.30	1.02	0.0281	0.2331	2.3075	-0.1230	0.3735
	19.54	59.54	0.2014	1.437	2.30	1.02	0.0283	0.2352	2.2571	-0.1441	0.3854
	20.04	59.43	0.2012	1.436	2.41	1.07	0.0299	0.2593	2.2632	-0.1439	0.4011

Table B53. Aerodynamic Data Summary for Run 115 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
115 (HELP-10C-ST^)	-3.58	59.43	0.2012	1.427	2.03	1.07	0.0273	0.2170	0.9063	-0.3630	0.1604
	0.62	59.23	0.2008	1.423	2.00	1.03	0.0257	0.2078	1.3100	-0.3666	0.1817
	2.67	59.26	0.2009	1.423	1.94	1.01	0.0254	0.1969	1.4545	-0.3442	0.1952
	4.73	58.93	0.2003	1.417	2.02	1.05	0.0271	0.2164	1.6314	-0.3307	0.2136
	6.80	59.32	0.2010	1.421	1.94	1.00	0.0252	0.1956	1.7536	-0.2995	0.2303
	7.86	59.35	0.2011	1.422	1.94	1.00	0.0253	0.1963	1.8397	-0.2882	0.2439
	8.90	58.96	0.2004	1.416	1.94	1.00	0.0255	0.1986	1.9153	-0.2745	0.2563
	9.94	59.09	0.2006	1.418	2.03	1.06	0.0272	0.2173	2.0130	-0.2693	0.2726
	10.96	59.02	0.2005	1.417	1.94	1.00	0.0254	0.1976	2.0595	-0.2488	0.2812
	11.98	59.32	0.2010	1.420	1.94	1.01	0.0254	0.1975	2.1277	-0.2329	0.2930
	13.01	59.20	0.2008	1.417	1.95	1.01	0.0256	0.2001	2.1929	-0.2173	0.3054
	14.03	59.41	0.2012	1.419	2.02	1.05	0.0267	0.2134	2.2595	-0.2048	0.3185
	15.06	59.41	0.2012	1.418	2.02	1.05	0.0269	0.2140	2.3042	-0.1879	0.3280
	16.07	59.36	0.2011	1.418	1.94	1.00	0.0251	0.1955	2.3233	-0.1607	0.3339
	16.57	59.32	0.2010	1.417	1.94	1.01	0.0254	0.1974	2.3603	-0.1466	0.3413
	17.08	59.22	0.2008	1.416	1.94	1.02	0.0259	0.2000	2.3727	-0.1369	0.3448
	17.57	59.41	0.2012	1.419	1.95	1.01	0.0253	0.1978	2.3597	-0.1313	0.3581
	18.09	59.51	0.2013	1.420	2.04	1.06	0.0266	0.2171	2.3743	-0.1328	0.3638
	18.57	59.56	0.2014	1.420	1.95	1.02	0.0255	0.1994	2.3413	-0.1177	0.3617
	19.05	59.23	0.2009	1.416	1.96	1.02	0.0257	0.2019	2.3020	-0.1205	0.3632
	19.53	59.62	0.2015	1.420	2.00	1.03	0.0258	0.2078	2.2373	-0.1632	0.3826
	20.04	59.56	0.2014	1.420	2.01	1.04	0.0261	0.2100	2.2411	-0.1558	0.3934

Table B54. Aerodynamic Data Summary for Run 116 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
116 (HELP-10C-ST^)	0.61	59.33	0.2011	1.412	2.06	1.08	0.0281	0.2246	1.3197	-0.3699	0.1831
	2.68	59.04	0.2006	1.409	1.96	1.04	0.0271	0.2079	1.4618	-0.3469	0.1958
	4.75	59.07	0.2006	1.409	1.97	1.03	0.0266	0.2072	1.6186	-0.3278	0.2128
	4.75	59.27	0.2010	1.411	1.98	1.04	0.0267	0.2074	1.6191	-0.3285	0.2127
	6.80	59.42	0.2012	1.412	1.98	1.04	0.0266	0.2070	1.7661	-0.3043	0.2322
	7.84	58.96	0.2004	1.407	2.00	1.04	0.0268	0.2128	1.8556	-0.2943	0.2464
	8.90	59.06	0.2006	1.408	2.05	1.08	0.0280	0.2244	1.9483	-0.2854	0.2613
	9.92	59.62	0.2016	1.414	2.04	1.08	0.0282	0.2216	2.0158	-0.2719	0.2726
	10.94	59.28	0.2010	1.409	1.96	1.02	0.0260	0.2021	2.0625	-0.2506	0.2813
	11.96	58.51	0.1996	1.400	1.96	1.02	0.0264	0.2065	2.1363	-0.2376	0.2947
	13.02	59.58	0.2015	1.413	2.07	1.08	0.0281	0.2257	2.2261	-0.2291	0.3112
	14.03	59.27	0.2010	1.408	1.97	1.03	0.0264	0.2057	2.2564	-0.2047	0.3175
	15.04	59.01	0.2005	1.405	1.98	1.03	0.0266	0.2082	2.2981	-0.1878	0.3268
	16.08	59.37	0.2011	1.409	1.98	1.04	0.0266	0.2071	2.3415	-0.1668	0.3372
	16.60	59.45	0.2013	1.410	2.03	1.05	0.0268	0.2149	2.3896	-0.1583	0.3476
	17.10	59.17	0.2008	1.407	2.05	1.06	0.0274	0.2219	2.4044	-0.1528	0.3515
	17.58	59.43	0.2012	1.409	2.05	1.07	0.0276	0.2217	2.3875	-0.1451	0.3630
	18.08	59.56	0.2015	1.410	1.97	1.02	0.0260	0.2033	2.3642	-0.1298	0.3627
	18.58	59.29	0.2010	1.408	1.98	1.03	0.0265	0.2072	2.3534	-0.1240	0.3641
	19.05	59.28	0.2010	1.408	2.03	1.03	0.0261	0.2132	2.3153	-0.1346	0.3670
	19.05	59.48	0.2013	1.410	2.07	1.09	0.0282	0.2269	2.3161	-0.1382	0.3667
	19.53	59.49	0.2014	1.410	1.97	1.03	0.0264	0.2060	2.2424	-0.1591	0.3798
	20.03	59.49	0.2014	1.409	1.98	1.03	0.0264	0.2061	2.2389	-0.1541	0.3927

Table B55. Aerodynamic Data Summary for Run 117 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
117 (AFC-off, repeat)	-3.90	60.56	0.2032	1.421	1.0	0	0	0	0.2602	-0.1842	0.1428
	0.37	59.15	0.2008	1.404	1.0	0	0	0	0.7854	-0.2244	0.1425
	2.44	58.62	0.1998	1.398	1.0	0	0	0	0.9514	-0.2081	0.1473
	4.52	58.20	0.1991	1.393	1.0	0	0	0	1.1141	-0.1896	0.1577
	6.58	57.85	0.1985	1.388	1.0	0	0	0	1.2670	-0.1686	0.1701
	7.61	57.43	0.1977	1.384	1.0	0	0	0	1.3455	-0.1578	0.1782
	8.66	58.96	0.2004	1.401	1.0	0	0	0	1.4226	-0.1447	0.1862
	9.70	59.04	0.2006	1.402	1.0	0	0	0	1.5037	-0.1351	0.1969
	10.72	59.28	0.2010	1.404	1.0	0	0	0	1.5767	-0.1235	0.2067
	11.76	59.14	0.2007	1.403	1.0	0	0	0	1.6501	-0.1109	0.2179
	12.79	59.20	0.2008	1.403	1.0	0	0	0	1.7172	-0.0969	0.2287
	13.79	59.38	0.2012	1.406	1.0	0	0	0	1.7814	-0.0837	0.2394
	14.83	59.19	0.2008	1.403	1.0	0	0	0	1.8418	-0.0693	0.2508
	15.88	59.23	0.2009	1.403	1.0	0	0	0	1.9045	-0.0559	0.2644
	16.39	59.11	0.2007	1.401	1.0	0	0	0	1.9327	-0.0485	0.2705
	16.90	59.44	0.2013	1.405	1.0	0	0	0	1.9602	-0.0402	0.2768
	17.40	59.30	0.2010	1.403	1.0	0	0	0	1.9918	-0.0298	0.2829
	17.93	59.24	0.2009	1.403	1.0	0	0	0	2.0197	-0.0248	0.3044
	18.44	59.59	0.2015	1.407	1.0	0	0	0	2.0443	-0.0161	0.3123
	18.93	59.65	0.2016	1.407	1.0	0	0	0	2.0541	-0.0083	0.3194
	19.43	59.28	0.2010	1.402	1.0	0	0	0	2.0574	-0.0050	0.3260
	19.94	59.57	0.2015	1.406	1.0	0	0	0	2.0417	-0.0146	0.3359

Table B56. Aerodynamic Data Summary for Run 127 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
127 (DRSWJ-10C-R2S+R1ENS^)	-3.88	57.19	0.2009	1.349	1.91	0.10	0.0019	0.0204	0.3034	-0.1945	0.1327
	0.39	57.03	0.2006	1.346	1.69	0.08	0.0013	0.0147	0.7867	-0.2220	0.1278
	2.45	57.35	0.2012	1.350	1.91	0.10	0.0018	0.0198	0.9648	-0.2071	0.1342
	4.52	57.35	0.2012	1.349	1.69	0.08	0.0013	0.0148	1.1221	-0.1874	0.1447
	6.59	57.13	0.2008	1.346	1.92	0.10	0.0018	0.0202	1.2946	-0.1716	0.1606
	7.62	57.22	0.2010	1.346	1.69	0.08	0.0013	0.0146	1.3679	-0.1601	0.1695
	8.67	56.92	0.2004	1.343	1.76	0.08	0.0013	0.0154	1.4536	-0.1505	0.1793
	9.70	56.94	0.2005	1.342	1.91	0.10	0.0018	0.0203	1.5400	-0.1421	0.1905
	10.73	57.07	0.2007	1.343	1.70	0.08	0.0013	0.0148	1.6098	-0.1305	0.2013
	11.76	57.10	0.2008	1.343	1.91	0.10	0.0018	0.0199	1.6937	-0.1200	0.2135
	12.79	57.32	0.2012	1.345	1.68	0.08	0.0013	0.0143	1.7511	-0.1063	0.2238
	13.84	57.22	0.2010	1.343	1.91	0.10	0.0018	0.0197	1.8358	-0.0950	0.2382
	14.87	57.32	0.2011	1.344	1.70	0.08	0.0013	0.0146	1.8907	-0.0805	0.2498
	15.91	57.33	0.2012	1.343	1.92	0.10	0.0018	0.0200	1.9631	-0.0685	0.2635
	16.38	57.40	0.2013	1.343	1.70	0.08	0.0013	0.0148	1.9808	-0.0601	0.2685
	16.92	57.06	0.2007	1.339	1.91	0.10	0.0018	0.0203	2.0248	-0.0540	0.2770
	17.42	57.18	0.2009	1.340	1.69	0.08	0.0013	0.0147	2.0421	-0.0439	0.2822
	17.95	57.43	0.2013	1.341	1.92	0.10	0.0018	0.0202	2.0805	-0.0404	0.3043
	18.46	56.82	0.2002	1.334	1.70	0.08	0.0013	0.0149	2.0887	-0.0320	0.3108
	18.96	57.44	0.2013	1.341	1.91	0.10	0.0018	0.0201	2.1092	-0.0268	0.3190
	19.45	57.37	0.2012	1.340	1.68	0.08	0.0013	0.0145	2.0786	-0.0267	0.3226
	19.94	57.54	0.2015	1.341	1.92	0.10	0.0018	0.0200	2.0468	-0.0667	0.3492

Table B57. Aerodynamic Data Summary for Run 128 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
128 (DRSWJ-10C-R2S+R1ENS^)	-3.86	57.29	0.2010	1.335	1.64	0.08	0.0013	0.0140	0.2957	-0.1942	0.1332
	0.32	57.10	0.2007	1.332	1.48	0.07	0.0009	0.0106	0.7722	-0.2199	0.1276
	2.44	57.24	0.2010	1.334	1.65	0.08	0.0013	0.0140	0.9563	-0.2065	0.1340
	4.52	57.23	0.2009	1.334	1.48	0.07	0.0009	0.0104	1.1156	-0.1872	0.1447
	6.58	57.22	0.2009	1.333	1.65	0.08	0.0013	0.0141	1.2854	-0.1703	0.1593
	7.62	57.32	0.2011	1.334	1.48	0.07	0.0009	0.0102	1.3610	-0.1595	0.1690
	8.67	57.22	0.2009	1.333	1.52	0.07	0.0009	0.0107	1.4413	-0.1488	0.1785
	12.81	57.25	0.2009	1.332	1.48	0.07	0.0009	0.0104	1.7421	-0.1041	0.2238
	16.92	57.25	0.2009	1.333	1.65	0.08	0.0013	0.0140	2.0099	-0.0519	0.2753
	18.95	57.32	0.2011	1.333	1.48	0.07	0.0009	0.0103	2.0825	-0.0219	0.3154

Table B58. Aerodynamic Data Summary for Run 129 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
129 (DRSWJ-10C-ENS^)	0.37	57.64	0.2009	1.416	1.51	0.15	0.0022	0.0234	0.8035	-0.2237	0.1274
	4.51	57.73	0.2011	1.409	1.50	0.14	0.0020	0.0220	1.1455	-0.1902	0.1468
	6.60	57.66	0.2010	1.406	1.50	0.15	0.0020	0.0225	1.3113	-0.1716	0.1634
	8.68	57.52	0.2007	1.399	1.50	0.14	0.0020	0.0223	1.4744	-0.1503	0.1820
	9.71	57.62	0.2009	1.399	1.50	0.14	0.0020	0.0222	1.5560	-0.1417	0.1934
	10.74	57.81	0.2012	1.400	1.50	0.14	0.0020	0.0222	1.6326	-0.1313	0.2045
	12.82	57.87	0.2013	1.397	1.50	0.14	0.0020	0.0220	1.7824	-0.1071	0.2286
	15.92	57.85	0.2013	1.395	1.50	0.14	0.0020	0.0221	1.9853	-0.0675	0.2685
	16.91	57.61	0.2009	1.392	1.50	0.14	0.0020	0.0224	2.0413	-0.0542	0.2810
	17.96	57.88	0.2014	1.393	1.50	0.14	0.0019	0.0219	2.0882	-0.0427	0.3068
	18.96	58.10	0.2018	1.395	1.50	0.15	0.0021	0.0225	2.1161	-0.0307	0.3204

Table B59. Aerodynamic Data Summary for Run 130 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
130 (DRSWJ-10C-ENS^)	0.40	57.65	0.2010	1.382	1.99	0.22	0.0042	0.0453	0.8582	-0.2339	0.1322
	4.56	57.24	0.2002	1.373	1.98	0.22	0.0043	0.0457	1.2094	-0.2043	0.1563
	6.63	57.59	0.2009	1.376	1.99	0.22	0.0042	0.0454	1.3725	-0.1843	0.1725
	8.73	57.60	0.2009	1.373	1.98	0.22	0.0042	0.0453	1.5382	-0.1645	0.1934
	9.73	57.78	0.2012	1.373	1.99	0.22	0.0043	0.0456	1.6141	-0.1542	0.2042
	10.77	57.77	0.2012	1.373	1.99	0.22	0.0042	0.0457	1.6899	-0.1426	0.2153
	12.86	57.63	0.2009	1.370	1.99	0.22	0.0042	0.0456	1.8439	-0.1202	0.2408
	15.93	57.77	0.2012	1.371	1.99	0.22	0.0042	0.0458	2.0463	-0.0820	0.2800
	16.96	57.94	0.2015	1.372	1.99	0.22	0.0042	0.0456	2.1042	-0.0677	0.2930
	17.98	57.78	0.2012	1.369	1.99	0.22	0.0042	0.0455	2.1424	-0.0575	0.3164
	18.98	58.04	0.2017	1.371	2.00	0.22	0.0042	0.0459	2.1567	-0.0493	0.3283

Table B60. Aerodynamic Data Summary for Run 131 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
131 (DRSWJ-10C-ENS^)	0.41	57.60	0.2009	1.361	2.51	0.258	0.0046	0.0677	0.8765	-0.2374	0.1337
	4.55	57.48	0.2007	1.358	2.52	0.258	0.0046	0.0683	1.2328	-0.2094	0.1590
	6.64	57.58	0.2009	1.359	2.53	0.26	0.0047	0.0689	1.4009	-0.1902	0.1776
	8.72	57.59	0.2009	1.358	2.53	0.258	0.0046	0.0684	1.5660	-0.1691	0.1985
	9.75	57.94	0.2015	1.361	2.54	0.26	0.0047	0.0684	1.6431	-0.1593	0.2098
	10.78	57.65	0.2010	1.357	2.54	0.26	0.0047	0.0691	1.7201	-0.1480	0.2215
	12.87	57.87	0.2014	1.358	2.53	0.259	0.0046	0.0683	1.8698	-0.1241	0.2461
	15.96	57.94	0.2015	1.359	2.54	0.26	0.0047	0.0686	2.0691	-0.0829	0.2845
	17.00	57.87	0.2014	1.358	2.55	0.262	0.0047	0.0696	2.1297	-0.0686	0.2983
	17.99	57.89	0.2015	1.357	2.54	0.261	0.0047	0.0691	2.1623	-0.0584	0.3219
	18.99	57.74	0.2012	1.355	2.55	0.263	0.0048	0.0700	2.1676	-0.0512	0.3319

Table B61. Aerodynamic Data Summary for Run 134 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
134 (AFC-off)	0.34	57.55	0.2009	1.365	1.0	0	0	0	0.7818	-0.2251	0.1332
	4.50	57.91	0.2016	1.366	1.0	0	0	0	1.1113	-0.1896	0.1489
	6.60	57.66	0.2011	1.363	1.0	0	0	0	1.2683	-0.1683	0.1632
	8.66	57.36	0.2006	1.358	1.0	0	0	0	1.4244	-0.1451	0.1795
	10.74	57.57	0.2009	1.360	1.0	0	0	0	1.5787	-0.1234	0.2011
	12.80	57.74	0.2012	1.361	1.0	0	0	0	1.7172	-0.0960	0.2225
	15.88	57.45	0.2007	1.357	1.0	0	0	0	1.8992	-0.0545	0.2581
	16.88	57.91	0.2015	1.362	1.0	0	0	0	1.9542	-0.0395	0.2703
	18.91	57.85	0.2014	1.361	1.0	0	0	0	2.0441	-0.0091	0.3130

Table B62. Aerodynamic Data Summary for Run 135 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
135 (DRSWJ-10C-R2S^)	0.37	57.18	0.2004	1.356	1.27	0.10	0.0011	0.0135	0.7907	-0.2239	0.1294
	4.52	56.87	0.1999	1.350	1.26	0.10	0.0010	0.0134	1.1300	-0.1895	0.1463
	6.61	57.15	0.2004	1.352	1.25	0.10	0.0010	0.0129	1.2966	-0.1710	0.1620
	8.67	57.13	0.2004	1.350	1.25	0.10	0.0010	0.0128	1.4583	-0.1505	0.1802
	9.70	56.87	0.1999	1.346	1.25	0.10	0.0010	0.0131	1.5414	-0.1417	0.1913
	10.73	57.40	0.2008	1.351	1.25	0.10	0.0010	0.0129	1.6181	-0.1310	0.2025
	12.81	57.24	0.2005	1.349	1.26	0.10	0.0010	0.0130	1.7632	-0.1050	0.2257
	15.90	57.11	0.2003	1.346	1.26	0.10	0.0010	0.0131	1.9549	-0.0667	0.2629
	16.89	57.17	0.2004	1.345	1.26	0.10	0.0010	0.0131	2.0122	-0.0522	0.2758
	17.94	57.43	0.2009	1.347	1.26	0.10	0.0010	0.0131	2.0647	-0.0392	0.3037
	18.97	57.19	0.2005	1.345	1.26	0.10	0.0010	0.0130	2.0977	-0.0234	0.3182

Table B63. Aerodynamic Data Summary for Runs 136+137 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
136+137 (DRSWJ-10C-R2S^ – a combined run of Runs 136 & 137)	-3.85	57.19	0.2005	1.339	1.50	0.14	0.0020	0.0227	0.3175	-0.1988	0.1308
	0.39	57.05	0.2003	1.336	1.50	0.15	0.0021	0.0233	0.8064	-0.2260	0.1253
	2.45	57.02	0.2002	1.335	1.50	0.14	0.0020	0.0225	0.9802	-0.2110	0.1329
	4.53	57.15	0.2004	1.336	1.50	0.14	0.0020	0.0222	1.1483	-0.1936	0.1437
	6.61	57.01	0.2002	1.333	1.50	0.14	0.0021	0.0229	1.3152	-0.1760	0.1598
	7.61	57.57	0.2012	1.348	1.49	0.15	0.0021	0.0229	1.3847	-0.1637	0.1672
	8.68	57.63	0.2013	1.346	1.49	0.15	0.0021	0.0228	1.4698	-0.1548	0.1779
	9.71	57.47	0.2010	1.344	1.49	0.15	0.0021	0.0229	1.5511	-0.1460	0.1890
	10.74	57.24	0.2006	1.341	1.49	0.15	0.0021	0.0230	1.6290	-0.1354	0.2010
	11.77	57.81	0.2016	1.347	1.49	0.14	0.0020	0.0225	1.7020	-0.1227	0.2120
	12.80	57.60	0.2012	1.344	1.50	0.15	0.0021	0.0228	1.7739	-0.1105	0.2242
	13.84	57.61	0.2013	1.343	1.50	0.15	0.0021	0.0228	1.8426	-0.0985	0.2368
	14.86	57.59	0.2012	1.343	1.50	0.15	0.0021	0.0230	1.9060	-0.0856	0.2489
	15.91	57.54	0.2011	1.342	1.50	0.14	0.0021	0.0228	1.9680	-0.0721	0.2622
	16.41	57.65	0.2013	1.342	1.50	0.14	0.0020	0.0223	1.9971	-0.0655	0.2684
	16.93	57.62	0.2013	1.342	1.49	0.14	0.0019	0.0217	2.0234	-0.0576	0.2746
	17.43	57.55	0.2011	1.340	1.53	0.14	0.0020	0.0231	2.0578	-0.0523	0.2921
	17.96	57.68	0.2014	1.341	1.49	0.14	0.0020	0.0220	2.0811	-0.0445	0.3025
	18.47	57.62	0.2013	1.340	1.50	0.14	0.0020	0.0225	2.1023	-0.0369	0.3105
	18.98	57.57	0.2012	1.339	1.50	0.14	0.0019	0.0218	2.1116	-0.0314	0.3172
	19.47	57.76	0.2015	1.341	1.50	0.14	0.0019	0.0220	2.0927	-0.0329	0.3223
	19.95	57.84	0.2017	1.341	1.50	0.14	0.0020	0.0223	2.0545	-0.0688	0.3475

Table B64. Aerodynamic Data Summary for Runs 138 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
138 (DRSWJ-10C-R2S^)	0.39	57.40	0.2009	1.336	2.04	0.22	0.0044	0.0482	0.8385	-0.2329	0.1240
	4.55	57.33	0.2008	1.335	2.03	0.22	0.0043	0.0476	1.1819	-0.2016	0.1447
	6.61	57.30	0.2007	1.334	2.05	0.22	0.0044	0.0488	1.3503	-0.1835	0.1609
	7.65	57.36	0.2008	1.335	2.04	0.22	0.0044	0.0481	1.4289	-0.1735	0.1703
	8.68	57.56	0.2012	1.337	2.04	0.22	0.0043	0.0477	1.5146	-0.1638	0.1815
	10.76	57.39	0.2009	1.335	2.04	0.22	0.0043	0.0480	1.6742	-0.1446	0.2051
	12.82	57.81	0.2016	1.340	2.05	0.22	0.0044	0.0480	1.8225	-0.1206	0.2296
	15.96	57.76	0.2015	1.341	2.04	0.22	0.0044	0.0481	2.0205	-0.0817	0.2699
	16.95	57.79	0.2016	1.340	2.04	0.22	0.0043	0.0481	2.0777	-0.0679	0.2827
	17.96	57.76	0.2015	1.340	2.04	0.22	0.0043	0.0479	2.1287	-0.0557	0.3090
	18.98	57.43	0.2009	1.336	2.04	0.22	0.0043	0.0483	2.1505	-0.0442	0.3233

Table B65. Aerodynamic Data Summary for Run 139 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
139 (DRSWJ-10C^)	0.41	57.50	0.2010	1.351	1.50	0.273	0.0037	0.0431	0.8880	-0.2530	0.1304
	4.56	57.53	0.2011	1.352	1.51	0.274	0.0037	0.0432	1.2490	-0.2210	0.1579
	6.64	57.25	0.2006	1.348	1.51	0.272	0.0037	0.0433	1.4042	-0.2031	0.1730
	7.68	57.47	0.2010	1.350	1.51	0.274	0.0037	0.0434	1.4860	-0.1927	0.1829
	8.72	57.76	0.2015	1.353	1.51	0.273	0.0037	0.0429	1.5632	-0.1826	0.1932
	10.81	57.37	0.2008	1.349	1.51	0.272	0.0037	0.0431	1.7240	-0.1604	0.2169
	12.86	57.45	0.2009	1.350	1.50	0.27	0.0036	0.0427	1.8691	-0.1365	0.2404
	15.96	57.57	0.2011	1.352	1.51	0.271	0.0036	0.0429	2.0699	-0.0968	0.2799
	16.99	57.60	0.2012	1.351	1.51	0.272	0.0037	0.0431	2.1250	-0.0829	0.2919
	17.99	57.61	0.2012	1.351	1.52	0.273	0.0037	0.0434	2.1641	-0.0718	0.3159
	18.99	57.81	0.2016	1.353	1.51	0.27	0.0036	0.0425	2.1688	-0.0629	0.3261

Table B66. Aerodynamic Data Summary for Run 140 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
140 (DRSWJ-10C^)	-3.75	58.00	0.2013	1.443	2.00	0.384	0.0062	0.0780	0.5326	-0.2582	0.1359
	0.44	57.97	0.2012	1.440	2.00	0.38	0.0061	0.0773	0.9951	-0.2814	0.1438
	2.55	57.49	0.2003	1.433	2.00	0.381	0.0062	0.0787	1.1823	-0.2689	0.1577
	4.62	57.85	0.2010	1.436	2.00	0.377	0.0060	0.0769	1.3486	-0.2491	0.1717
	6.69	57.82	0.2010	1.435	2.00	0.379	0.0061	0.0775	1.5117	-0.2282	0.1896
	7.72	57.93	0.2011	1.434	2.00	0.376	0.0060	0.0766	1.5882	-0.2174	0.1997
	8.77	58.37	0.2019	1.439	2.01	0.38	0.0061	0.0768	1.6685	-0.2066	0.2114
	9.78	58.32	0.2018	1.436	2.00	0.373	0.0059	0.0755	1.7458	-0.1956	0.2225
	10.83	57.43	0.2002	1.425	2.01	0.373	0.0060	0.0774	1.8254	-0.1839	0.2348
	11.88	57.79	0.2009	1.427	1.99	0.369	0.0059	0.0750	1.8965	-0.1705	0.2465
	12.89	57.78	0.2009	1.426	1.99	0.373	0.0060	0.0761	1.9685	-0.1579	0.2584
	13.93	57.67	0.2007	1.424	2.00	0.37	0.0059	0.0762	2.0411	-0.1457	0.2710
	14.97	58.13	0.2015	1.429	2.00	0.371	0.0059	0.0756	2.1039	-0.1321	0.2833
	16.00	57.99	0.2012	1.425	1.97	0.365	0.0058	0.0736	2.1551	-0.1184	0.2955
	16.49	58.02	0.2013	1.425	1.98	0.368	0.0059	0.0744	2.1825	-0.1110	0.3013
	17.04	57.96	0.2012	1.424	1.99	0.366	0.0058	0.0745	2.2212	-0.1010	0.3098
	17.52	58.02	0.2013	1.424	1.99	0.371	0.0060	0.0755	2.2406	-0.0950	0.3147
	18.02	58.16	0.2015	1.423	1.98	0.367	0.0058	0.0740	2.2301	-0.0923	0.3300
	18.55	58.14	0.2015	1.423	1.99	0.366	0.0058	0.0742	2.2340	-0.0872	0.3345
	19.01	58.25	0.2017	1.422	1.99	0.368	0.0058	0.0745	2.2166	-0.0852	0.3374
	19.49	58.12	0.2015	1.421	2.00	0.372	0.0060	0.0758	2.1538	-0.1127	0.3504
	19.99	58.20	0.2016	1.421	2.01	0.372	0.0059	0.0761	2.1335	-0.1341	0.3722

Table B67. Aerodynamic Data Summary for Run 141 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
	-3.73	57.92	0.2011	1.408	2.50	0.475	0.0078	0.1218	0.5919	-0.2689	0.1395
	0.47	57.64	0.2006	1.405	2.50	0.479	0.0080	0.1241	1.0482	-0.2924	0.1497
	2.57	57.82	0.2009	1.406	2.47	0.47	0.0078	0.1197	1.2276	-0.2777	0.1621
	4.64	57.82	0.2009	1.405	2.48	0.473	0.0078	0.1209	1.3928	-0.2605	0.1779
	6.73	57.91	0.2011	1.405	2.48	0.471	0.0078	0.1201	1.5583	-0.2369	0.1959
	7.75	58.04	0.2013	1.406	2.49	0.475	0.0079	0.1210	1.6384	-0.2269	0.2074
	8.79	57.95	0.2011	1.404	2.50	0.475	0.0078	0.1221	1.7198	-0.2174	0.2191
	9.82	57.66	0.2006	1.400	2.51	0.477	0.0079	0.1238	1.7979	-0.2064	0.2306
	10.85	58.20	0.2016	1.406	2.48	0.474	0.0078	0.1202	1.8703	-0.1923	0.2424
141	11.90	57.80	0.2009	1.401	2.49	0.476	0.0079	0.1225	1.9454	-0.1799	0.2551
	12.93	58.39	0.2019	1.407	2.49	0.474	0.0078	0.1200	2.0168	-0.1664	0.2677
(DRSWJ-10C^)	13.96	57.94	0.2011	1.402	2.50	0.477	0.0079	0.1226	2.0857	-0.1530	0.2803
	14.99	58.14	0.2015	1.403	2.49	0.473	0.0078	0.1206	2.1491	-0.1399	0.2926
	16.02	58.06	0.2013	1.402	2.50	0.479	0.0080	0.1227	2.2054	-0.1265	0.3065
	16.51	58.13	0.2015	1.402	2.49	0.474	0.0078	0.1209	2.2285	-0.1181	0.3106
	17.04	58.13	0.2015	1.402	2.49	0.478	0.0079	0.1222	2.2662	-0.1076	0.3188
	17.53	58.15	0.2015	1.401	2.48	0.472	0.0077	0.1202	2.2584	-0.1063	0.3329
	18.04	57.86	0.2010	1.398	2.49	0.478	0.0079	0.1229	2.2651	-0.0996	0.3373
	18.56	58.23	0.2016	1.401	2.49	0.476	0.0078	0.1216	2.2581	-0.0933	0.3398
	19.02	58.06	0.2013	1.399	2.50	0.477	0.0079	0.1225	2.2349	-0.0924	0.3427
	19.50	58.08	0.2014	1.398	2.49	0.474	0.0078	0.1214	2.1581	-0.1308	0.3599
	19.99	58.13	0.2015	1.398	2.49	0.478	0.0079	0.1225	2.1511	-0.1433	0.3800

Table B68. Aerodynamic Data Summary for Run 142 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
	-3.80	57.98	0.2012	1.393	1.51	0.275	0.0037	0.0427	0.4179	-0.2239	0.1310
	0.44	57.87	0.2010	1.391	1.51	0.276	0.0037	0.0429	0.8969	-0.2505	0.1328
	2.50	57.73	0.2007	1.389	1.51	0.276	0.0037	0.0431	1.0805	-0.2384	0.1449
	4.58	57.89	0.2010	1.390	1.51	0.276	0.0037	0.0430	1.2548	-0.2190	0.1598
	6.64	57.84	0.2009	1.389	1.51	0.276	0.0037	0.0431	1.4095	-0.2014	0.1750
	7.68	58.04	0.2013	1.391	1.51	0.276	0.0037	0.0430	1.4908	-0.1910	0.1844
	8.73	57.81	0.2009	1.386	1.51	0.274	0.0036	0.0428	1.5696	-0.1802	0.1949
	9.75	57.73	0.2007	1.385	1.51	0.275	0.0037	0.0431	1.6500	-0.1708	0.2066
	10.79	57.85	0.2009	1.386	1.51	0.274	0.0036	0.0428	1.7278	-0.1591	0.2186
142	11.81	57.74	0.2007	1.385	1.51	0.275	0.0037	0.0432	1.8026	-0.1471	0.2312
	12.87	57.83	0.2009	1.384	1.51	0.274	0.0036	0.0429	1.8745	-0.1352	0.2433
(DRSWJ-10C^)	13.89	57.86	0.2009	1.384	1.51	0.274	0.0036	0.0428	1.9484	-0.1217	0.2561
	14.91	58.05	0.2013	1.386	1.51	0.276	0.0037	0.0431	2.0158	-0.1077	0.2694
	15.94	58.14	0.2014	1.387	1.51	0.274	0.0036	0.0427	2.0763	-0.0955	0.2822
	16.45	58.09	0.2014	1.386	1.52	0.277	0.0037	0.0433	2.1022	-0.0900	0.2884
	16.98	58.00	0.2012	1.384	1.51	0.274	0.0036	0.0429	2.1311	-0.0819	0.2947
	17.48	57.92	0.2011	1.383	1.52	0.277	0.0037	0.0436	2.1608	-0.0749	0.3018
	18.00	58.09	0.2014	1.384	1.51	0.272	0.0036	0.0424	2.1650	-0.0706	0.3186
	18.50	58.03	0.2013	1.383	1.51	0.274	0.0036	0.0428	2.1772	-0.0662	0.3250
	18.99	57.89	0.2010	1.381	1.52	0.275	0.0037	0.0432	2.1769	-0.0629	0.3292
	19.48	57.98	0.2011	1.382	1.52	0.276	0.0037	0.0434	2.1302	-0.0797	0.3385
	19.97	58.23	0.2016	1.385	1.52	0.274	0.0036	0.0427	2.0989	-0.1083	0.3635

Table B69. Aerodynamic Data Summary for Run 143 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
	-3.77	58.20	0.2015	1.381	1.76	0.355	0.0058	0.0643	0.4832	-0.2427	0.1331
	0.46	57.86	0.2009	1.377	1.76	0.351	0.0057	0.0639	0.9554	-0.2684	0.1390
	2.53	57.57	0.2004	1.373	1.76	0.353	0.0058	0.0649	1.1422	-0.2574	0.1524
	4.61	58.05	0.2013	1.380	1.76	0.352	0.0057	0.0640	1.3118	-0.2395	0.1670
	6.67	57.69	0.2006	1.375	1.77	0.354	0.0058	0.0652	1.4772	-0.2191	0.1846
	7.71	57.68	0.2006	1.374	1.75	0.35	0.0057	0.0638	1.5539	-0.2080	0.1943
	8.76	57.65	0.2005	1.374	1.75	0.35	0.0057	0.0641	1.6349	-0.1979	0.2064
	9.78	57.95	0.2011	1.377	1.76	0.349	0.0057	0.0635	1.7116	-0.1871	0.2171
	10.82	57.39	0.2001	1.370	1.76	0.352	0.0058	0.0652	1.7910	-0.1753	0.2296
143	11.86	58.00	0.2012	1.376	1.75	0.35	0.0057	0.0635	1.8589	-0.1625	0.2403
	12.90	57.89	0.2010	1.375	1.76	0.35	0.0057	0.0640	1.9364	-0.1499	0.2539
(DRSWJ-10C^)	13.90	58.03	0.2012	1.377	1.75	0.354	0.0058	0.0643	2.0043	-0.1372	0.2650
	14.96	57.99	0.2012	1.376	1.76	0.35	0.0057	0.0639	2.0756	-0.1236	0.2789
	15.99	58.09	0.2013	1.377	1.76	0.351	0.0057	0.0637	2.1286	-0.1104	0.2910
	16.48	58.01	0.2012	1.376	1.76	0.349	0.0057	0.0636	2.1570	-0.1045	0.2975
	17.03	58.25	0.2016	1.379	1.76	0.348	0.0056	0.0630	2.1907	-0.0945	0.3046
	17.50	58.18	0.2015	1.378	1.76	0.351	0.0057	0.0639	2.1913	-0.0920	0.3200
	18.04	58.17	0.2015	1.378	1.76	0.348	0.0056	0.0634	2.2058	-0.0853	0.3259
	18.50	58.05	0.2013	1.376	1.77	0.35	0.0057	0.0641	2.2164	-0.0815	0.3307
	19.00	58.03	0.2012	1.374	1.76	0.346	0.0056	0.0631	2.2040	-0.0779	0.3342
	19.47	58.30	0.2017	1.378	1.76	0.35	0.0057	0.0636	2.1357	-0.1056	0.3469
	19.98	58.10	0.2014	1.375	1.76	0.345	0.0056	0.0629	2.1241	-0.1246	0.3696

Table B70. Aerodynamic Data Summary for Run 145 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
	-3.72	57.79	0.2009	1.383	2.99	0.573	0.0097	0.1774	0.6388	-0.2813	0.1427
	0.52	57.76	0.2008	1.382	2.98	0.57	0.0096	0.1763	1.0856	-0.3023	0.1539
	2.59	57.66	0.2007	1.381	2.99	0.574	0.0097	0.1786	1.2715	-0.2890	0.1684
	4.66	57.84	0.2010	1.379	2.98	0.577	0.0097	0.1782	1.4286	-0.2695	0.1827
	6.74	57.86	0.2010	1.379	2.99	0.58	0.0098	0.1796	1.5931	-0.2467	0.2020
	7.76	57.92	0.2011	1.379	2.99	0.58	0.0097	0.1796	1.6724	-0.2367	0.2130
	8.81	57.83	0.2010	1.374	2.98	0.583	0.0098	0.1804	1.7550	-0.2267	0.2258
	9.84	57.18	0.1998	1.366	2.99	0.585	0.0100	0.1847	1.8388	-0.2162	0.2391
	10.85	57.76	0.2009	1.371	2.98	0.582	0.0098	0.1805	1.9078	-0.2036	0.2503
145	11.92	57.71	0.2008	1.370	2.99	0.583	0.0098	0.1815	1.9861	-0.1899	0.2637
	12.95	57.82	0.2010	1.371	2.99	0.578	0.0097	0.1797	2.0572	-0.1765	0.2755
(DRSWJ-10C^)	13.97	57.92	0.2011	1.372	2.99	0.58	0.0097	0.1803	2.1215	-0.1627	0.2878
	15.01	57.68	0.2007	1.368	2.97	0.576	0.0097	0.1788	2.1924	-0.1497	0.3017
	16.03	58.12	0.2015	1.373	2.98	0.575	0.0096	0.1770	2.2323	-0.1353	0.3123
	16.53	58.11	0.2015	1.374	2.98	0.578	0.0097	0.1778	2.2616	-0.1268	0.3171
	17.07	57.89	0.2011	1.370	2.99	0.579	0.0097	0.1800	2.2907	-0.1168	0.3243
	17.54	58.18	0.2016	1.373	2.98	0.579	0.0097	0.1779	2.2852	-0.1142	0.3381
	18.05	58.09	0.2014	1.372	2.99	0.578	0.0097	0.1788	2.2872	-0.1075	0.3419
	18.55	57.77	0.2009	1.368	2.99	0.577	0.0097	0.1800	2.2793	-0.1013	0.3435
	19.04	58.23	0.2017	1.373	3.00	0.581	0.0097	0.1798	2.2367	-0.1015	0.3448
	19.50	58.15	0.2016	1.371	2.99	0.576	0.0096	0.1782	2.1650	-0.1428	0.3640
	20.00	58.03	0.2013	1.369	3.00	0.579	0.0097	0.1801	2.1650	-0.1523	0.3821

Table B71. Aerodynamic Data Summary for Run 146 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
	-3.76	57.94	0.2012	1.365	2.23	0.424	0.0070	0.0981	0.5558	-0.2653	0.1398
	0.43	57.82	0.2009	1.363	2.23	0.427	0.0071	0.0992	1.0179	-0.2902	0.1485
	2.56	57.65	0.2006	1.361	2.24	0.43	0.0072	0.1007	1.2036	-0.2766	0.1618
	4.65	57.79	0.2009	1.363	2.24	0.43	0.0071	0.1004	1.3703	-0.2585	0.1770
	6.72	57.74	0.2008	1.362	2.25	0.433	0.0072	0.1017	1.5310	-0.2364	0.1945
	7.73	57.80	0.2009	1.362	2.23	0.425	0.0070	0.0987	1.6090	-0.2258	0.2047
	8.78	57.54	0.2004	1.358	2.23	0.428	0.0071	0.1004	1.6937	-0.2154	0.2172
	9.81	58.21	0.2016	1.367	2.24	0.427	0.0070	0.0986	1.7677	-0.2037	0.2276
	10.84	57.75	0.2008	1.361	2.24	0.432	0.0072	0.1012	1.8438	-0.1914	0.2403
146	11.86	57.73	0.2008	1.361	2.23	0.425	0.0070	0.0990	1.9185	-0.1788	0.2518
	12.90	57.67	0.2006	1.360	2.24	0.429	0.0071	0.1004	1.9906	-0.1660	0.2649
(DRSWJ-10C^)	13.94	58.13	0.2015	1.365	2.23	0.426	0.0070	0.0985	2.0574	-0.1521	0.2759
	14.96	58.06	0.2013	1.365	2.24	0.43	0.0071	0.1001	2.1198	-0.1389	0.2888
	16.01	58.01	0.2013	1.365	2.23	0.428	0.0071	0.0992	2.1754	-0.1255	0.3015
	16.50	57.93	0.2011	1.364	2.24	0.428	0.0071	0.0998	2.1993	-0.1185	0.3069
	17.02	58.08	0.2014	1.365	2.23	0.425	0.0070	0.0982	2.2283	-0.1086	0.3124
	17.52	58.12	0.2014	1.365	2.24	0.427	0.0070	0.0990	2.2347	-0.1054	0.3291
	18.01	58.27	0.2017	1.366	2.24	0.423	0.0069	0.0978	2.2390	-0.0988	0.3319
	18.55	58.21	0.2016	1.365	2.24	0.426	0.0070	0.0987	2.2395	-0.0929	0.3370
	19.01	58.08	0.2014	1.363	2.24	0.423	0.0069	0.0982	2.2185	-0.0914	0.3390
	19.49	58.33	0.2018	1.368	2.24	0.426	0.0070	0.0986	2.1356	-0.1329	0.3580
	19.99	58.27	0.2017	1.365	2.24	0.423	0.0069	0.0980	2.1405	-0.1368	0.3735

Table B72. Aerodynamic Data Summary for Run 147 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
	-3.87	57.99	0.2012	1.362	1.0	0	0	0	0.2632	-0.1857	0.1406
	0.36	57.86	0.2010	1.360	1.0	0	0	0	0.7792	-0.2237	0.1394
	2.44	57.59	0.2005	1.358	1.0	0	0	0	0.9526	-0.2089	0.1451
	4.52	57.80	0.2009	1.362	1.0	0	0	0	1.1108	-0.1897	0.1543
	6.60	57.95	0.2012	1.363	1.0	0	0	0	1.2668	-0.1683	0.1671
	7.61	57.94	0.2011	1.362	1.0	0	0	0	1.3441	-0.1566	0.1748
	8.64	57.61	0.2005	1.357	1.0	0	0	0	1.4216	-0.1453	0.1832
	9.69	57.66	0.2006	1.358	1.0	0	0	0	1.5025	-0.1348	0.1936
	10.72	58.05	0.2013	1.362	1.0	0	0	0	1.5775	-0.1238	0.2043
147	11.74	57.94	0.2011	1.361	1.0	0	0	0	1.6474	-0.1105	0.2141
	12.78	57.89	0.2010	1.360	1.0	0	0	0	1.7162	-0.0962	0.2252
(AFC-off)	13.82	57.87	0.2010	1.360	1.0	0	0	0	1.7821	-0.0832	0.2374
	14.83	58.03	0.2013	1.364	1.0	0	0	0	1.8445	-0.0693	0.2491
	15.86	57.81	0.2009	1.362	1.0	0	0	0	1.9010	-0.0562	0.2613
	16.40	57.94	0.2011	1.362	1.0	0	0	0	1.9301	-0.0477	0.2682
	16.90	57.98	0.2012	1.362	1.0	0	0	0	1.9565	-0.0403	0.2741
	17.40	57.77	0.2008	1.360	1.0	0	0	0	1.9866	-0.0299	0.2805
	17.93	57.94	0.2011	1.362	1.0	0	0	0	2.0094	-0.0269	0.3012
	18.44	58.09	0.2014	1.362	1.0	0	0	0	2.0350	-0.0169	0.3096
	18.93	57.93	0.2011	1.361	1.0	0	0	0	2.0471	-0.0084	0.3164
	19.44	58.28	0.2017	1.365	1.0	0	0	0	2.0485	-0.0056	0.3231
	19.94	57.87	0.2010	1.360	1.0	0	0	0	2.0349	-0.0118	0.3314

Table B73. Aerodynamic Data Summary for Run 152 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
152 (AFC-off +SWVGs)	0.36	58.44	0.2010	1.493	1.0	0	0	0	0.7811	-0.2235	0.1360
	8.66	58.60	0.2013	1.487	1.0	0	0	0	1.4174	-0.1420	0.1816
	12.77	58.57	0.2012	1.484	1.0	0	0	0	1.7114	-0.0939	0.2251
	16.88	58.46	0.2010	1.480	1.0	0	0	0	1.9535	-0.0397	0.2736
	17.93	58.87	0.2018	1.480	1.0	0	0	0	2.0224	-0.0184	0.2884
	18.95	58.64	0.2014	1.476	1.0	0	0	0	2.0439	-0.0115	0.3168

Table B74. Aerodynamic Data Summary for Run 153 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
153 (AFC-off)	0.37	58.40	0.2009	1.468	1.0	0	0	0	0.7843	-0.2241	0.1365
	8.66	58.36	0.2009	1.465	1.0	0	0	0	1.4187	-0.1424	0.1821
	12.81	58.35	0.2008	1.463	1.0	0	0	0	1.7178	-0.0938	0.2256
	16.90	58.59	0.2013	1.464	1.0	0	0	0	1.9563	-0.0391	0.2735
	17.93	58.90	0.2018	1.466	1.0	0	0	0	2.0188	-0.0198	0.2878
	18.93	58.87	0.2018	1.465	1.0	0	0	0	2.0489	-0.0106	0.3158
	19.92	58.49	0.2011	1.458	1.0	0	0	0	2.0402	-0.0099	0.3296

Table B75. Aerodynamic Data Summary for Run 159 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
159 (APJ-10C^)	-3.83	58.39	0.2011	1.413	1.52	0.322	0.0048	0.0501	0.3509	-0.2044	0.1333
	0.42	58.51	0.2013	1.413	1.52	0.321	0.0047	0.0497	0.8500	-0.2329	0.1336
	2.48	58.37	0.2010	1.411	1.52	0.321	0.0048	0.0499	1.0242	-0.2201	0.1430
	4.55	58.36	0.2010	1.409	1.52	0.317	0.0047	0.0493	1.1903	-0.2007	0.1539
	6.64	58.37	0.2010	1.409	1.52	0.318	0.0047	0.0495	1.3571	-0.1822	0.1712
	7.66	58.18	0.2007	1.405	1.52	0.316	0.0047	0.0494	1.4387	-0.1721	0.1802
	8.71	58.55	0.2014	1.407	1.52	0.317	0.0047	0.0492	1.5233	-0.1630	0.1912
	9.73	58.08	0.2005	1.401	1.52	0.317	0.0047	0.0498	1.6029	-0.1529	0.2026
	10.76	58.40	0.2011	1.404	1.51	0.312	0.0045	0.0484	1.6735	-0.1417	0.2128
	11.81	58.52	0.2013	1.405	1.52	0.314	0.0046	0.0486	1.7493	-0.1293	0.2256
	12.84	58.65	0.2015	1.405	1.52	0.311	0.0045	0.0479	1.8239	-0.1163	0.2380
	13.87	58.43	0.2011	1.402	1.52	0.315	0.0046	0.0490	1.8922	-0.1045	0.2505
	14.91	58.56	0.2014	1.403	1.52	0.314	0.0046	0.0487	1.9581	-0.0903	0.2630
	15.93	58.41	0.2011	1.402	1.52	0.317	0.0047	0.0494	2.0165	-0.0749	0.2753
	16.43	58.35	0.2010	1.400	1.52	0.317	0.0047	0.0495	2.0424	-0.0674	0.2801
	16.95	58.33	0.2010	1.399	1.52	0.319	0.0047	0.0499	2.0709	-0.0603	0.2873
	17.45	58.32	0.2009	1.398	1.52	0.314	0.0046	0.0490	2.0978	-0.0512	0.2928
	17.97	58.80	0.2018	1.403	1.52	0.317	0.0046	0.0490	2.1152	-0.0460	0.3115
	18.48	58.65	0.2015	1.401	1.52	0.315	0.0046	0.0489	2.1258	-0.0407	0.3176
	18.99	58.58	0.2014	1.401	1.52	0.318	0.0047	0.0495	2.1273	-0.0361	0.3236
	19.46	58.56	0.2013	1.400	1.52	0.316	0.0046	0.0493	2.0860	-0.0482	0.3311
	19.95	58.52	0.2013	1.399	1.53	0.319	0.0047	0.0499	2.0565	-0.0791	0.3557

Table B76. Aerodynamic Data Summary for Run 163 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
163 (APJ-10C^)	-3.78	58.50	0.2013	1.426	2.09	0.457	0.0081	0.0971	0.4730	-0.2400	0.1406
	0.46	58.02	0.2004	1.419	2.10	0.455	0.0081	0.0980	0.9428	-0.2645	0.1439
	2.53	58.02	0.2005	1.418	2.10	0.452	0.0080	0.0974	1.1251	-0.2534	0.1558
	4.60	58.06	0.2005	1.418	2.10	0.451	0.0080	0.0970	1.2912	-0.2349	0.1697
	6.66	58.19	0.2008	1.419	2.09	0.451	0.0080	0.0966	1.4555	-0.2143	0.1869
	7.69	58.47	0.2012	1.420	2.03	0.459	0.0085	0.0948	1.5250	-0.2004	0.1953
	7.70	58.57	0.2014	1.419	2.09	0.444	0.0078	0.0943	1.5330	-0.2031	0.1965
	8.74	58.55	0.2014	1.416	2.10	0.444	0.0078	0.0946	1.6149	-0.1924	0.2082
	9.77	58.13	0.2007	1.409	2.09	0.443	0.0079	0.0953	1.6895	-0.1805	0.2184
	10.78	58.43	0.2012	1.412	2.10	0.444	0.0078	0.0950	1.7623	-0.1677	0.2295
	11.83	58.25	0.2009	1.409	2.10	0.442	0.0078	0.0950	1.8343	-0.1521	0.2401
	12.88	58.24	0.2009	1.408	2.10	0.444	0.0079	0.0956	1.9052	-0.1392	0.2528
	13.88	58.43	0.2012	1.409	2.10	0.443	0.0078	0.0950	1.9692	-0.1255	0.2635
	14.94	58.47	0.2013	1.410	2.10	0.442	0.0078	0.0950	2.0328	-0.1118	0.2763
	15.97	58.39	0.2011	1.406	2.10	0.442	0.0078	0.0950	2.0900	-0.0974	0.2884
	16.46	58.22	0.2008	1.404	2.11	0.445	0.0079	0.0963	2.1151	-0.0903	0.2942
	17.00	58.46	0.2013	1.405	2.10	0.445	0.0079	0.0957	2.1463	-0.0812	0.3006
	17.50	58.42	0.2012	1.404	2.11	0.444	0.0078	0.0958	2.1703	-0.0735	0.3066
	18.02	58.10	0.2006	1.399	2.10	0.444	0.0079	0.0962	2.1789	-0.0677	0.3244
	18.48	58.31	0.2010	1.401	2.10	0.445	0.0079	0.0961	2.1847	-0.0618	0.3290
	19.01	58.58	0.2015	1.403	2.10	0.442	0.0077	0.0946	2.1700	-0.0581	0.3325
	19.47	58.68	0.2017	1.404	2.10	0.446	0.0079	0.0955	2.1152	-0.0839	0.3449
	19.97	58.51	0.2013	1.400	2.10	0.443	0.0078	0.0952	2.0995	-0.1054	0.3680

Table B77. Aerodynamic Data Summary for Run 164 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
164 (APJ-10C^)	-3.78	58.45	0.2012	1.393	2.47	0.537	0.0097	0.1362	0.5185	-0.2565	0.1438
	0.44	58.27	0.2009	1.391	2.47	0.538	0.0097	0.1372	0.9863	-0.2837	0.1500
	2.54	58.03	0.2005	1.388	2.48	0.54	0.0098	0.1387	1.1690	-0.2711	0.1629
	4.62	58.24	0.2009	1.390	2.47	0.537	0.0097	0.1369	1.3371	-0.2525	0.1768
	6.68	58.37	0.2011	1.392	2.48	0.538	0.0097	0.1370	1.5020	-0.2317	0.1948
	7.72	58.69	0.2017	1.394	2.48	0.539	0.0097	0.1363	1.5777	-0.2205	0.2045
	8.77	58.33	0.2010	1.389	2.48	0.547	0.0101	0.1396	1.6584	-0.2111	0.2160
	9.79	58.36	0.2011	1.389	2.48	0.536	0.0097	0.1366	1.7329	-0.1986	0.2268
	10.82	58.43	0.2012	1.389	2.48	0.538	0.0097	0.1371	1.8070	-0.1870	0.2387
	12.90	58.28	0.2009	1.388	2.49	0.538	0.0097	0.1379	1.9507	-0.1607	0.2625
	16.01	58.52	0.2013	1.389	2.49	0.54	0.0097	0.1380	2.1330	-0.1164	0.2986
	16.98	58.40	0.2011	1.388	2.48	0.537	0.0097	0.1371	2.1822	-0.1009	0.3087
	18.00	58.62	0.2015	1.390	2.49	0.539	0.0097	0.1371	2.2131	-0.0864	0.3325
	19.00	58.56	0.2014	1.388	2.49	0.536	0.0096	0.1366	2.2014	-0.0774	0.3407

Table B78. Aerodynamic Data Summary for Run 165 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
165 (APJ-10C^)	0.48	58.30	0.2009	1.382	2.96	0.642	0.0116	0.1961	1.0341	-0.2971	0.1550
	4.64	58.31	0.2010	1.381	2.97	0.647	0.0117	0.1984	1.3785	-0.2662	0.1821
	6.70	58.28	0.2009	1.380	2.96	0.653	0.0120	0.1995	1.5443	-0.2438	0.2005
	7.74	58.39	0.2011	1.382	2.96	0.654	0.0120	0.1994	1.6213	-0.2334	0.2113
	8.79	58.22	0.2008	1.380	2.96	0.64	0.0115	0.1960	1.7011	-0.2235	0.2230
	9.81	58.06	0.2005	1.377	2.96	0.641	0.0116	0.1973	1.7790	-0.2116	0.2344
	10.82	58.45	0.2012	1.381	2.97	0.66	0.0122	0.2014	1.8521	-0.1994	0.2460
	12.90	58.29	0.2009	1.380	2.97	0.656	0.0121	0.2012	1.9937	-0.1746	0.2707
	16.00	58.61	0.2015	1.384	2.97	0.645	0.0116	0.1961	2.1726	-0.1285	0.3061
	17.00	58.48	0.2013	1.381	2.97	0.645	0.0116	0.1971	2.2248	-0.1116	0.3171
	18.01	58.67	0.2016	1.383	2.96	0.639	0.0114	0.1938	2.2458	-0.0970	0.3389
	19.01	58.44	0.2012	1.380	2.97	0.644	0.0116	0.1971	2.2245	-0.0892	0.3466

Table B79. Aerodynamic Data Summary for Run 168 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
168 (DRSWJ-10C^, M_∞ = 0.15)	0.50	33.14	0.1508	1.066	2.01	0.385	0.0108	0.1862	1.1248	-0.3235	0.1590
	4.68	33.21	0.1509	1.066	2.01	0.381	0.0107	0.1835	1.4689	-0.2890	0.1885
	6.74	33.29	0.1511	1.066	2.01	0.378	0.0106	0.1816	1.6334	-0.2677	0.2078
	7.79	33.10	0.1507	1.063	2.01	0.378	0.0106	0.1833	1.7264	-0.2594	0.2226
	8.81	33.33	0.1512	1.065	2.00	0.375	0.0105	0.1794	1.8091	-0.2491	0.2345
	10.87	33.05	0.1505	1.060	2.00	0.376	0.0107	0.1820	1.9590	-0.2260	0.2589
	12.97	33.22	0.1509	1.063	2.01	0.377	0.0106	0.1818	2.1034	-0.1991	0.2847
	16.05	33.24	0.1510	1.063	2.00	0.374	0.0105	0.1800	2.2693	-0.1560	0.3197
	17.04	33.26	0.1510	1.063	2.01	0.377	0.0106	0.1818	2.3174	-0.1404	0.3433
	18.07	33.31	0.1512	1.063	2.01	0.377	0.0106	0.1813	2.3222	-0.1262	0.3504
	19.01	33.36	0.1513	1.063	2.01	0.379	0.0106	0.1824	2.2711	-0.1182	0.3518

Table B80. Aerodynamic Data Summary for Run 169 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
169 (DRSWJ-10C^, M_∞ = 0.15)	0.44	33.07	0.1506	1.057	1.53	0.289	0.0070	0.1071	0.9988	-0.2869	0.1472
	4.64	33.01	0.1504	1.055	1.53	0.289	0.0070	0.1074	1.3523	-0.2580	0.1761
	6.69	32.99	0.1504	1.055	1.53	0.29	0.0070	0.1078	1.5152	-0.2378	0.1935
	7.72	33.25	0.1510	1.059	1.51	0.282	0.0066	0.1023	1.5864	-0.2241	0.2025
	8.77	32.99	0.1504	1.054	1.51	0.281	0.0066	0.1031	1.6713	-0.2139	0.2144
	8.73	33.12	0.1507	1.056	1.51	0.281	0.0066	0.1026	1.6655	-0.2141	0.2114
	10.85	32.94	0.1503	1.053	1.52	0.282	0.0066	0.1043	1.8262	-0.1928	0.2383
	12.91	32.99	0.1504	1.054	1.51	0.278	0.0064	0.1018	1.9633	-0.1651	0.2596
	16.01	33.27	0.1510	1.058	1.51	0.28	0.0065	0.1016	2.1494	-0.1207	0.2981
	16.99	33.19	0.1508	1.056	1.50	0.277	0.0064	0.1006	2.1949	-0.1057	0.3187
	18.02	33.13	0.1507	1.055	1.51	0.28	0.0065	0.1023	2.2288	-0.0930	0.3324
	19.03	33.16	0.1508	1.055	1.51	0.278	0.0064	0.1015	2.2128	-0.0842	0.3374

Table B81. Aerodynamic Data Summary for Run 170 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
170 (DRSWJ-10C^, M_∞ = 0.15)	0.61	33.18	0.1508	1.055	3.01	0.591	0.0174	0.4294	1.3355	-0.3503	0.1782
	4.77	32.92	0.1502	1.050	3.00	0.592	0.0176	0.4339	1.6687	-0.3186	0.2122
	6.83	33.15	0.1507	1.054	3.01	0.593	0.0175	0.4310	1.8267	-0.2976	0.2342
	7.84	33.34	0.1512	1.057	3.01	0.593	0.0174	0.4277	1.9006	-0.2880	0.2462
	8.91	33.24	0.1509	1.055	3.01	0.594	0.0175	0.4312	1.9784	-0.2770	0.2603
	10.99	33.20	0.1508	1.054	3.01	0.589	0.0172	0.4271	2.1202	-0.2519	0.2844
	13.03	33.22	0.1509	1.055	3.01	0.592	0.0174	0.4304	2.2365	-0.2230	0.3059
	13.03	33.20	0.1508	1.054	3.02	0.594	0.0174	0.4336	2.2380	-0.2235	0.3061
	16.10	33.29	0.1511	1.056	3.01	0.591	0.0173	0.4275	2.3888	-0.1753	0.3394
	17.09	33.38	0.1513	1.057	3.02	0.595	0.0174	0.4298	2.4188	-0.1617	0.3599
	18.11	33.26	0.1510	1.055	3.02	0.598	0.0177	0.4345	2.4111	-0.1486	0.3645
	19.08	33.28	0.1510	1.055	3.02	0.596	0.0175	0.4338	2.3274	-0.1460	0.3639

Table B82. Aerodynamic Data Summary for Run 171 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
171 (AFC-off, M_∞ = 0.15)	-3.86	33.32	0.1511	1.057	1.0	0	0	0	0.2901	-0.2021	0.1391
	0.36	32.95	0.1502	1.050	1.0	0	0	0	0.7828	-0.2163	0.1411
	2.45	33.11	0.1506	1.053	1.0	0	0	0	0.9564	-0.2060	0.1449
	4.52	33.12	0.1506	1.053	1.0	0	0	0	1.1200	-0.1883	0.1560
	6.58	33.16	0.1507	1.053	1.0	0	0	0	1.2723	-0.1674	0.1672
	7.62	33.28	0.1510	1.056	1.0	0	0	0	1.3508	-0.1563	0.1758
	8.66	33.17	0.1507	1.054	1.0	0	0	0	1.4291	-0.1441	0.1847
	9.69	33.20	0.1508	1.055	1.0	0	0	0	1.5102	-0.1340	0.1953
	10.72	33.17	0.1508	1.054	1.0	0	0	0	1.5846	-0.1229	0.2055
	11.77	33.12	0.1506	1.053	1.0	0	0	0	1.6552	-0.1096	0.2166
	12.80	33.10	0.1506	1.053	1.0	0	0	0	1.7199	-0.0952	0.2279
	13.80	33.23	0.1509	1.055	1.0	0	0	0	1.7870	-0.0812	0.2403
	14.84	33.10	0.1506	1.053	1.0	0	0	0	1.8467	-0.0671	0.2524
	15.86	33.18	0.1508	1.054	1.0	0	0	0	1.9058	-0.0516	0.2646
	16.38	33.12	0.1506	1.053	1.0	0	0	0	1.9326	-0.0429	0.2708
	16.92	33.25	0.1509	1.055	1.0	0	0	0	1.9599	-0.0349	0.2774
	17.40	33.31	0.1511	1.056	1.0	0	0	0	1.9925	-0.0269	0.2966
	17.93	33.13	0.1506	1.053	1.0	0	0	0	2.0193	-0.0175	0.3051
	18.44	33.05	0.1505	1.052	1.0	0	0	0	2.0443	-0.0073	0.3139
	18.93	33.23	0.1509	1.054	1.0	0	0	0	2.0549	-0.0001	0.3206
	19.45	33.37	0.1512	1.057	1.0	0	0	0	2.0576	0.0054	0.3266
	19.96	33.20	0.1508	1.054	1.0	0	0	0	2.0479	0.0024	0.3346

Table B83. Aerodynamic Data Summary for Run 172 with TWICS.

Run No. (Configuration)	α (deg)	q_∞ (psf)	M_∞	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	C_μ	C_π	C_L	C_m	C_D
	-3.87	58.52	0.2015	1.391	1.0	0	0	0	0.2691	-0.1835	0.1382
	0.37	58.25	0.2010	1.387	1.0	0	0	0	0.7889	-0.2243	0.1377
	2.44	58.13	0.2008	1.385	1.0	0	0	0	0.9553	-0.2077	0.1429
	4.52	58.28	0.2011	1.384	1.0	0	0	0	1.1158	-0.1883	0.1533
	6.60	58.21	0.2010	1.383	1.0	0	0	0	1.2712	-0.1677	0.1662
	7.61	58.26	0.2011	1.383	1.0	0	0	0	1.3483	-0.1558	0.1738
	8.66	58.34	0.2012	1.383	1.0	0	0	0	1.4254	-0.1441	0.1824
	9.69	58.16	0.2009	1.380	1.0	0	0	0	1.5069	-0.1344	0.1933
	10.72	57.70	0.2000	1.375	1.0	0	0	0	1.5814	-0.1229	0.2034
172	11.74	57.68	0.2000	1.374	1.0	0	0	0	1.6517	-0.1099	0.2141
	12.80	57.39	0.1995	1.369	1.0	0	0	0	1.7202	-0.0947	0.2256
(AFC-off)	13.82	57.83	0.2003	1.375	1.0	0	0	0	1.7857	-0.0813	0.2372
	14.84	58.36	0.2012	1.381	1.0	0	0	0	1.8468	-0.0681	0.2488
	15.88	58.18	0.2009	1.378	1.0	0	0	0	1.9060	-0.0537	0.2617
	16.38	58.43	0.2013	1.380	1.0	0	0	0	1.9353	-0.0467	0.2675
	16.92	58.51	0.2015	1.380	1.0	0	0	0	1.9599	-0.0373	0.2741
	17.40	58.35	0.2012	1.378	1.0	0	0	0	1.9940	-0.0280	0.2806
	17.93	58.28	0.2011	1.378	1.0	0	0	0	2.0258	-0.0222	0.3021
	18.46	58.52	0.2015	1.380	1.0	0	0	0	2.0455	-0.0138	0.3107
	18.94	58.39	0.2013	1.378	1.0	0	0	0	2.0555	-0.0071	0.3173
	19.45	58.50	0.2015	1.379	1.0	0	0	0	2.0577	-0.0037	0.3242
	19.94	58.72	0.2019	1.381	1.0	0	0	0	2.0397	-0.0085	0.3312

Appendix C.

CRM-SHL-AFC Aerodynamic Data Tables without Wall Correction for Runs 45 to 172

Table C1. Aerodynamic Data Summary for Run 45 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
45 (AFC-off – increasing α)	-3.99	57.67	0.2000	1.379	1.0	0	0	0	0.2702	-0.1857	0.1402
	-3.52	57.63	0.2000	1.374	1.0	0	0	0	0.3253	-0.1840	0.1375
	-2.99	57.67	0.2000	1.373	1.0	0	0	0	0.3986	-0.1879	0.1350
	-2.51	57.62	0.1999	1.371	1.0	0	0	0	0.4661	-0.1931	0.1340
	-2.00	57.59	0.1999	1.369	1.0	0	0	0	0.5397	-0.2003	0.1348
	-1.49	57.62	0.1999	1.368	1.0	0	0	0	0.6030	-0.2060	0.1332
	-1.03	57.67	0.2000	1.368	1.0	0	0	0	0.6660	-0.2120	0.1339
	-0.48	57.74	0.2001	1.368	1.0	0	0	0	0.7294	-0.2156	0.1346
	-0.03	57.67	0.2000	1.364	1.0	0	0	0	0.7877	-0.2240	0.1359
	1.99	57.67	0.2000	1.363	1.0	0	0	0	0.9588	-0.2088	0.1383
	3.97	57.67	0.2000	1.361	1.0	0	0	0	1.1177	-0.1884	0.1446
	6.04	57.58	0.1999	1.359	1.0	0	0	0	1.2773	-0.1643	0.1547
	7.02	57.31	0.1994	1.355	1.0	0	0	0	1.3530	-0.1496	0.1617
	8.03	57.76	0.2002	1.358	1.0	0	0	0	1.4274	-0.1349	0.1679
	9.00	57.56	0.1998	1.355	1.0	0	0	0	1.5069	-0.1239	0.1768
	10.00	57.44	0.1996	1.353	1.0	0	0	0	1.5824	-0.1118	0.1863
	11.03	57.65	0.2000	1.355	1.0	0	0	0	1.6561	-0.0957	0.1958
	11.99	57.62	0.1999	1.353	1.0	0	0	0	1.7188	-0.0815	0.2046
	13.02	57.56	0.1998	1.350	1.0	0	0	0	1.7870	-0.0650	0.2147
	14.01	57.54	0.1998	1.349	1.0	0	0	0	1.8494	-0.0507	0.2252
	15.03	57.80	0.2003	1.352	1.0	0	0	0	1.9122	-0.0358	0.2365
	15.53	57.68	0.2000	1.349	1.0	0	0	0	1.9414	-0.0284	0.2415
	16.04	57.76	0.2002	1.349	1.0	0	0	0	1.9729	-0.0203	0.2470
	16.51	57.72	0.2001	1.347	1.0	0	0	0	2.0044	-0.0101	0.2521
	17.00	57.66	0.2000	1.346	1.0	0	0	0	2.0296	-0.0037	0.2707
	17.54	58.10	0.2008	1.351	1.0	0	0	0	2.0607	0.0047	0.2793
	18.01	57.65	0.2000	1.345	1.0	0	0	0	2.0780	0.0125	0.2856
	18.50	57.54	0.1998	1.343	1.0	0	0	0	2.0790	0.0168	0.2916
	19.04	57.77	0.2002	1.345	1.0	0	0	0	2.0661	0.0093	0.3031
	19.58	57.60	0.1999	1.342	1.0	0	0	0	2.0537	-0.0084	0.3329
	20.02	57.93	0.2005	1.345	1.0	0	0	0	2.0610	-0.0092	0.3478
	20.52	57.79	0.2002	1.342	1.0	0	0	0	2.0633	-0.0055	0.3658
	21.01	57.69	0.2000	1.340	1.0	0	0	0	2.0660	0.0016	0.3812
	21.48	57.70	0.2001	1.339	1.0	0	0	0	2.0892	-0.0105	0.3861
	21.97	57.56	0.1998	1.337	1.0	0	0	0	2.0596	0.0215	0.4090
	22.51	57.69	0.2000	1.338	1.0	0	0	0	2.0197	0.0218	0.4249
	23.06	57.65	0.2000	1.336	1.0	0	0	0	1.9837	0.0231	0.4532

Table C2. Aerodynamic Data Summary for Run 46 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
46 (AFC-off – decreasing α)	23.06	57.49	0.1997	1.333	1.0	0	0	0	1.9855	0.0257	0.4511
	22.45	57.58	0.1998	1.333	1.0	0	0	0	2.0200	0.0349	0.4260
	22.01	57.71	0.2001	1.334	1.0	0	0	0	2.0547	0.0205	0.4144
	21.50	57.72	0.2001	1.334	1.0	0	0	0	2.0705	0.0084	0.3957
	21.01	57.65	0.2000	1.333	1.0	0	0	0	2.0757	-0.0052	0.3761
	20.50	57.59	0.1999	1.332	1.0	0	0	0	2.0711	-0.0114	0.3599
	20.04	57.48	0.1997	1.330	1.0	0	0	0	2.0577	-0.0149	0.3457
	19.49	57.66	0.2000	1.331	1.0	0	0	0	2.0532	-0.0162	0.3294
	18.96	57.58	0.1998	1.330	1.0	0	0	0	2.0700	0.0048	0.3012
	18.42	57.49	0.1997	1.329	1.0	0	0	0	2.0823	0.0128	0.2901
	17.97	57.57	0.1998	1.329	1.0	0	0	0	2.0809	0.0074	0.2850
	17.50	57.37	0.1995	1.327	1.0	0	0	0	2.0605	0.0000	0.2777
	16.96	57.67	0.2000	1.330	1.0	0	0	0	2.0327	-0.0095	0.2693
	16.55	57.60	0.1999	1.328	1.0	0	0	0	2.0092	-0.0159	0.2636
	16.00	57.67	0.2000	1.330	1.0	0	0	0	1.9764	-0.0255	0.2554
	15.51	57.53	0.1998	1.327	1.0	0	0	0	1.9445	-0.0324	0.2486
	15.03	57.67	0.2000	1.328	1.0	0	0	0	1.9124	-0.0399	0.2423
	13.99	57.73	0.2001	1.328	1.0	0	0	0	1.8472	-0.0556	0.2292
	13.02	57.57	0.1998	1.326	1.0	0	0	0	1.7841	-0.0707	0.2178
	11.95	57.72	0.2001	1.327	1.0	0	0	0	1.7148	-0.0856	0.2053
	11.03	57.72	0.2001	1.327	1.0	0	0	0	1.6520	-0.0988	0.1955
	10.00	57.70	0.2001	1.327	1.0	0	0	0	1.5774	-0.1134	0.1856
	8.98	57.69	0.2000	1.326	1.0	0	0	0	1.5072	-0.1265	0.1762
	8.03	57.78	0.2002	1.327	1.0	0	0	0	1.4284	-0.1368	0.1684
	7.00	57.79	0.2002	1.327	1.0	0	0	0	1.3500	-0.1486	0.1609
	6.04	57.85	0.2003	1.327	1.0	0	0	0	1.2746	-0.1617	0.1551
	4.03	57.81	0.2003	1.326	1.0	0	0	0	1.1218	-0.1873	0.1441
	1.97	57.75	0.2001	1.326	1.0	0	0	0	0.9575	-0.2088	0.1374
	-0.01	57.74	0.2001	1.325	1.0	0	0	0	0.7883	-0.2243	0.1352
	-0.48	57.67	0.2000	1.324	1.0	0	0	0	0.7275	-0.2164	0.1345
	-1.08	57.71	0.2001	1.324	1.0	0	0	0	0.6572	-0.2126	0.1338
	-1.63	57.73	0.2001	1.324	1.0	0	0	0	0.5831	-0.2045	0.1329
	-1.98	57.68	0.2000	1.323	1.0	0	0	0	0.5420	-0.2012	0.1341
	-2.45	57.72	0.2001	1.323	1.0	0	0	0	0.4758	-0.1958	0.1345
	-2.94	57.66	0.2000	1.322	1.0	0	0	0	0.4078	-0.1904	0.1347
	-3.54	57.71	0.2001	1.322	1.0	0	0	0	0.3241	-0.1859	0.1373
	-3.97	57.72	0.2001	1.322	1.0	0	0	0	0.2747	-0.1921	0.1395

Table C3. Aerodynamic Data Summary for Run 47 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
47 (AFC-off – with floor BLRS)	-4.01	57.63	0.2000	1.330	1.0	0	0	0	0.2700	-0.1896	0.1400
	0.03	57.57	0.1999	1.328	1.0	0	0	0	0.7920	-0.2212	0.1360
	1.97	57.80	0.2003	1.329	1.0	0	0	0	0.9579	-0.2046	0.1387
	4.05	57.78	0.2002	1.327	1.0	0	0	0	1.1277	-0.1824	0.1458
	6.00	57.64	0.2000	1.326	1.0	0	0	0	1.2799	-0.1604	0.1554
	7.00	57.51	0.1998	1.324	1.0	0	0	0	1.3603	-0.1478	0.1616
	8.01	57.66	0.2000	1.324	1.0	0	0	0	1.4384	-0.1363	0.1685
	9.00	57.62	0.2000	1.322	1.0	0	0	0	1.5214	-0.1249	0.1776
	10.00	57.72	0.2001	1.323	1.0	0	0	0	1.5954	-0.1127	0.1862
	10.99	57.51	0.1998	1.320	1.0	0	0	0	1.6684	-0.0983	0.1948
	11.99	57.58	0.1999	1.320	1.0	0	0	0	1.7369	-0.0831	0.2042
	13.02	57.63	0.2000	1.320	1.0	0	0	0	1.8080	-0.0670	0.2145
	14.01	57.64	0.2000	1.319	1.0	0	0	0	1.8679	-0.0522	0.2249
	15.01	57.46	0.1997	1.317	1.0	0	0	0	1.9275	-0.0364	0.2356
	15.48	57.41	0.1996	1.316	1.0	0	0	0	1.9565	-0.0280	0.2411
	16.00	57.49	0.1997	1.316	1.0	0	0	0	1.9875	-0.0190	0.2471
	16.49	57.71	0.2001	1.318	1.0	0	0	0	2.0184	-0.0079	0.2641
	17.02	57.59	0.1999	1.315	1.0	0	0	0	2.0464	0.0031	0.2718
	17.48	57.54	0.1998	1.314	1.0	0	0	0	2.0710	0.0120	0.2789
	17.99	57.38	0.1995	1.311	1.0	0	0	0	2.0904	0.0212	0.2870
	18.48	57.91	0.2005	1.317	1.0	0	0	0	2.0969	0.0283	0.2936
	19.00	57.80	0.2003	1.315	1.0	0	0	0	2.0921	0.0292	0.3027

Table C4. Aerodynamic Data Summary for Run 52 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
52 (AFC-off)	-4.01	58.85	0.2018	1.379	1.0	0	0	0	0.2717	-0.1868	0.1393
	0.01	57.14	0.1988	1.349	1.0	0	0	0	0.7957	-0.2268	0.1352
	2.02	56.85	0.1983	1.345	1.0	0	0	0	0.9656	-0.2105	0.1382
	4.01	57.77	0.1999	1.352	1.0	0	0	0	1.1285	-0.1917	0.1450
	6.02	57.74	0.1999	1.351	1.0	0	0	0	1.2873	-0.1701	0.1549
	7.00	57.61	0.1996	1.348	1.0	0	0	0	1.3611	-0.1592	0.1606
	8.03	57.89	0.2002	1.346	1.0	0	0	0	1.4416	-0.1473	0.1676
	9.00	57.81	0.2000	1.344	1.0	0	0	0	1.5227	-0.1375	0.1764
	10.02	57.64	0.1997	1.342	1.0	0	0	0	1.6002	-0.1265	0.1855
	11.01	57.65	0.1997	1.342	1.0	0	0	0	1.6714	-0.1129	0.1939
	11.99	57.79	0.2000	1.339	1.0	0	0	0	1.7411	-0.0998	0.2031
	13.00	57.72	0.1999	1.338	1.0	0	0	0	1.8100	-0.0852	0.2135
	14.01	57.69	0.1998	1.337	1.0	0	0	0	1.8705	-0.0711	0.2234
	15.01	57.40	0.1993	1.333	1.0	0	0	0	1.9313	-0.0568	0.2343
	15.53	57.78	0.2000	1.338	1.0	0	0	0	1.9640	-0.0492	0.2404
	16.02	57.84	0.2001	1.336	1.0	0	0	0	1.9911	-0.0404	0.2457
	16.49	57.83	0.2001	1.335	1.0	0	0	0	2.0172	-0.0304	0.2510
	17.00	57.68	0.1998	1.333	1.0	0	0	0	2.0510	-0.0237	0.2711
	17.50	57.91	0.2002	1.336	1.0	0	0	0	2.0716	-0.0158	0.2790
	18.01	57.72	0.1999	1.330	1.0	0	0	0	2.0854	-0.0078	0.2860
	18.48	58.02	0.2004	1.333	1.0	0	0	0	2.0878	-0.0049	0.2926
	19.00	57.65	0.1997	1.329	1.0	0	0	0	2.0741	-0.0088	0.3018

Table C5. Aerodynamic Data Summary for Run 54 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	Re_u (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
54 (AFC-off, repeat))	-3.97	57.83	0.2001	1.343	1.0	0	0	0	0.2823	-0.1905	0.1372
	0.03	57.60	0.1997	1.338	1.0	0	0	0	0.7954	-0.2263	0.1312
	2.04	57.66	0.1998	1.338	1.0	0	0	0	0.9686	-0.2114	0.1356
	4.01	57.70	0.1999	1.338	1.0	0	0	0	1.1286	-0.1917	0.1422
	6.02	57.83	0.2001	1.339	1.0	0	0	0	1.2884	-0.1700	0.1522
	7.02	57.65	0.1998	1.336	1.0	0	0	0	1.3660	-0.1596	0.1595
	7.99	57.51	0.1995	1.334	1.0	0	0	0	1.4422	-0.1476	0.1658
	9.02	57.47	0.1995	1.333	1.0	0	0	0	1.5275	-0.1382	0.1753
	10.00	57.72	0.1999	1.335	1.0	0	0	0	1.6022	-0.1266	0.1841
	10.99	57.89	0.2002	1.336	1.0	0	0	0	1.6747	-0.1131	0.1927
	11.99	57.76	0.2000	1.335	1.0	0	0	0	1.7417	-0.0990	0.2020
	13.00	57.84	0.2001	1.335	1.0	0	0	0	1.8106	-0.0855	0.2128
	14.01	57.74	0.1999	1.333	1.0	0	0	0	1.8729	-0.0708	0.2232
	15.01	57.61	0.1997	1.331	1.0	0	0	0	1.9328	-0.0561	0.2336
	15.49	57.77	0.2000	1.331	1.0	0	0	0	1.9625	-0.0488	0.2391
	16.02	57.84	0.2001	1.332	1.0	0	0	0	1.9905	-0.0393	0.2451
	16.49	58.09	0.2006	1.335	1.0	0	0	0	2.0195	-0.0301	0.2508
	17.00	57.89	0.2002	1.332	1.0	0	0	0	2.0503	-0.0223	0.2706
	17.50	57.61	0.1997	1.328	1.0	0	0	0	2.0698	-0.0142	0.2782
	17.99	57.84	0.2001	1.330	1.0	0	0	0	2.0821	-0.0076	0.2851
	18.50	57.60	0.1997	1.327	1.0	0	0	0	2.0831	-0.0023	0.2918
	19.00	57.68	0.1998	1.328	1.0	0	0	0	2.0712	-0.0098	0.3018

Table C6. Aerodynamic Data Summary for Run 57 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	Re_u (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
57 (HELP-8C)	-4.01	57.90	0.2000	1.379	1.55	0.62	0.0138	0.1006	0.6769	-0.2948	0.1516
	0.01	57.86	0.2000	1.378	1.55	0.62	0.0137	0.1006	1.1189	-0.3087	0.1560
	2.02	57.89	0.2000	1.377	1.55	0.63	0.0139	0.1011	1.2934	-0.2931	0.1651
	4.01	57.85	0.2000	1.376	1.55	0.63	0.0139	0.1013	1.4569	-0.2759	0.1770
	6.00	57.90	0.2000	1.375	1.55	0.63	0.0139	0.1016	1.6103	-0.2515	0.1906
	6.98	58.04	0.2003	1.376	1.55	0.63	0.0139	0.1011	1.6901	-0.2420	0.2002
	8.01	57.76	0.1998	1.372	1.56	0.63	0.0138	0.1017	1.7742	-0.2317	0.2106
	9.02	57.81	0.1999	1.372	1.52	0.61	0.0134	0.0973	1.8398	-0.2159	0.2188
	10.00	57.75	0.1998	1.370	1.51	0.61	0.0131	0.0959	1.9091	-0.2041	0.2278
	10.99	57.63	0.1996	1.368	1.51	0.60	0.0129	0.0954	1.9770	-0.1903	0.2365
	12.02	57.66	0.1996	1.368	1.51	0.60	0.0130	0.0960	2.0465	-0.1765	0.2466
	13.00	57.99	0.2002	1.371	1.52	0.61	0.0131	0.0960	2.1087	-0.1624	0.2555
	14.01	58.02	0.2003	1.371	1.52	0.61	0.0131	0.0960	2.1728	-0.1458	0.2664
	15.01	57.76	0.1998	1.367	1.53	0.61	0.0133	0.0983	2.2357	-0.1300	0.2784
	15.49	57.91	0.2001	1.368	1.54	0.62	0.0136	0.1001	2.2652	-0.1212	0.2837
	16.02	57.76	0.1998	1.366	1.56	0.63	0.0142	0.1034	2.2898	-0.1124	0.2888
	16.49	58.04	0.2003	1.368	1.57	0.64	0.0142	0.1044	2.2837	-0.1078	0.3035
	17.00	57.84	0.1999	1.365	1.58	0.64	0.0142	0.1051	2.2906	-0.0999	0.3087
	17.50	57.92	0.2001	1.365	1.58	0.63	0.0139	0.1041	2.2894	-0.0925	0.3128
	18.01	57.80	0.1999	1.363	1.58	0.64	0.0143	0.1060	2.2682	-0.0885	0.3169
	18.50	57.73	0.1997	1.362	1.58	0.64	0.0144	0.1064	2.2069	-0.1197	0.3347
	19.00	58.11	0.2004	1.365	1.58	0.64	0.0141	0.1045	2.1859	-0.1316	0.3545

Table C7. Aerodynamic Data Summary for Run 59 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
	-3.99	57.92	0.2001	1.325	1.94	0.79	0.0207	0.1614	0.7986	-0.3199	0.15145
	0.03	58.04	0.2003	1.324	1.94	0.80	0.0209	0.1626	1.2158	-0.3255	0.15983
	2.01	57.78	0.1998	1.320	1.94	0.79	0.0208	0.1635	1.3863	-0.3107	0.17117
	4.03	57.79	0.1998	1.318	1.95	0.80	0.0209	0.1644	1.5490	-0.2922	0.18291
	6.00	57.88	0.2000	1.318	1.96	0.80	0.0207	0.1650	1.7035	-0.2690	0.19793
	7.00	57.62	0.1995	1.315	1.95	0.80	0.0210	0.1658	1.7884	-0.2597	0.20842
	8.01	58.03	0.2003	1.317	1.96	0.80	0.0205	0.1643	1.8717	-0.2485	0.21882
	9.00	57.41	0.1992	1.310	1.95	0.80	0.0209	0.1670	1.9489	-0.2375	0.22879
	10.00	57.95	0.2001	1.314	1.95	0.80	0.0209	0.1660	2.0200	-0.2247	0.23829
59	10.99	57.22	0.1988	1.306	1.95	0.80	0.0209	0.1678	2.0907	-0.2117	0.24850
	12.01	58.02	0.2003	1.313	1.95	0.80	0.0210	0.1653	2.1562	-0.1981	0.25824
(HELP-8C)	13.00	57.86	0.2000	1.311	1.95	0.80	0.0209	0.1656	2.2179	-0.1840	0.26751
	13.99	57.85	0.1999	1.311	1.96	0.81	0.0211	0.1672	2.2732	-0.1702	0.27756
	15.01	57.73	0.1997	1.309	1.95	0.79	0.0207	0.1648	2.3285	-0.1522	0.28804
	15.48	57.98	0.2002	1.312	1.95	0.79	0.0204	0.1631	2.3582	-0.1435	0.29356
	16.02	57.86	0.1999	1.308	1.94	0.80	0.0210	0.1642	2.3578	-0.1356	0.30902
	16.49	57.90	0.2000	1.308	1.95	0.79	0.0206	0.1630	2.3644	-0.1284	0.31216
	17.00	57.99	0.2002	1.309	1.94	0.79	0.0205	0.1614	2.3617	-0.1206	0.31543
	17.50	57.99	0.2002	1.308	1.94	0.79	0.0208	0.1626	2.3498	-0.1137	0.31810
	18.01	58.01	0.2002	1.306	1.94	0.78	0.0203	0.1601	2.3024	-0.1182	0.32236
	18.50	57.95	0.2001	1.306	1.94	0.78	0.0203	0.1603	2.2455	-0.1554	0.34798
	19.00	57.81	0.1999	1.304	1.94	0.78	0.0205	0.1610	2.2527	-0.1542	0.36310

Table C8. Aerodynamic Data Summary for Run 60 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
	-3.97	57.80	0.2000	1.305	1.24	0.44	0.0075	0.0582	0.5378	-0.2660	0.1433
	0.03	57.87	0.2001	1.303	1.25	0.44	0.0076	0.0591	0.9962	-0.2892	0.1415
	2.01	57.62	0.1997	1.299	1.25	0.44	0.0076	0.0594	1.1803	-0.2750	0.1514
	4.03	57.82	0.2001	1.299	1.26	0.45	0.0077	0.0600	1.3487	-0.2578	0.1632
	6.02	57.75	0.1999	1.298	1.26	0.45	0.0078	0.0604	1.5065	-0.2368	0.1753
	7.00	57.91	0.2002	1.300	1.26	0.45	0.0076	0.0596	1.5790	-0.2260	0.1825
	7.99	57.78	0.2000	1.296	1.24	0.43	0.0071	0.0566	1.6476	-0.2120	0.1890
	9.00	57.81	0.2000	1.296	1.24	0.43	0.0071	0.0566	1.7256	-0.1984	0.1985
	10.00	57.59	0.1996	1.294	1.24	0.43	0.0072	0.0573	1.7978	-0.1857	0.2074
60	10.99	57.83	0.2001	1.296	1.24	0.43	0.0072	0.0570	1.8662	-0.1704	0.2164
	12.01	58.09	0.2005	1.297	1.25	0.45	0.0078	0.0598	1.9353	-0.1573	0.2259
(HELP-8C)	13.00	57.62	0.1997	1.292	1.24	0.43	0.0071	0.0571	1.9914	-0.1390	0.2340
	14.01	57.73	0.1999	1.293	1.24	0.43	0.0072	0.0572	2.0554	-0.1212	0.2442
	15.01	57.78	0.2000	1.294	1.24	0.43	0.0072	0.0572	2.1090	-0.1042	0.2552
	15.48	57.81	0.2001	1.293	1.25	0.43	0.0073	0.0579	2.1344	-0.0962	0.2599
	16.00	57.72	0.1999	1.289	1.26	0.44	0.0075	0.0596	2.1616	-0.0880	0.2768
	16.49	57.86	0.2001	1.291	1.29	0.46	0.0081	0.0632	2.1980	-0.0833	0.2852
	17.02	57.89	0.2002	1.292	1.29	0.46	0.0082	0.0636	2.2114	-0.0744	0.2918
	17.48	57.87	0.2002	1.291	1.29	0.46	0.0081	0.0631	2.2123	-0.0661	0.2949
	18.01	57.88	0.2002	1.290	1.25	0.43	0.0072	0.0580	2.1899	-0.0524	0.2974
	18.50	57.75	0.1999	1.288	1.25	0.44	0.0073	0.0584	2.1382	-0.0795	0.3132
	19.00	57.79	0.2000	1.289	1.26	0.43	0.0072	0.0582	2.1220	-0.0972	0.3349

Table C9. Aerodynamic Data Summary for Run 61 without TWICS.

Run No. (Configuration)	$\alpha_{,u}$ (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
	-3.99	57.88	0.2002	1.287	2.29	0.48	0.0109	0.1181	0.6506	-0.2328	0.1559
	0.03	57.70	0.1999	1.284	2.18	0.46	0.0102	0.1068	1.0865	-0.2512	0.1610
	2.01	57.73	0.1999	1.284	2.22	0.46	0.0104	0.1098	1.2649	-0.2395	0.1707
	4.01	57.88	0.2002	1.284	2.19	0.46	0.0103	0.1071	1.4198	-0.2215	0.1808
	6.02	57.74	0.1999	1.282	2.19	0.46	0.0103	0.1076	1.5784	-0.1989	0.1952
	7.00	57.94	0.2003	1.284	2.20	0.46	0.0102	0.1068	1.6608	-0.1888	0.2045
	7.99	57.77	0.2000	1.282	2.25	0.47	0.0106	0.1131	1.7521	-0.1808	0.2156
	8.98	57.99	0.2004	1.284	2.28	0.48	0.0108	0.1157	1.8333	-0.1692	0.2250
	10.00	57.69	0.1999	1.281	2.29	0.48	0.0108	0.1180	1.9113	-0.1572	0.2358
61	10.99	58.05	0.2005	1.285	2.30	0.48	0.0107	0.1170	1.9783	-0.1425	0.2449
	12.01	57.78	0.2000	1.281	2.18	0.46	0.0103	0.1066	2.0319	-0.1237	0.2521
(HELP-4C)	13.00	57.72	0.1999	1.280	2.19	0.46	0.0103	0.1073	2.0961	-0.1085	0.2619
	14.01	57.80	0.2001	1.281	2.19	0.46	0.0102	0.1072	2.1479	-0.0935	0.2699
	15.01	57.64	0.1998	1.280	2.19	0.46	0.0103	0.1080	2.2004	-0.0747	0.2799
	15.49	57.86	0.2002	1.281	2.20	0.46	0.0103	0.1077	2.2276	-0.0632	0.2853
	16.02	57.97	0.2004	1.282	2.31	0.48	0.0108	0.1188	2.2532	-0.0557	0.3023
	16.49	58.02	0.2005	1.283	2.31	0.48	0.0108	0.1186	2.2598	-0.0463	0.3061
	17.02	57.69	0.1999	1.278	2.31	0.49	0.0110	0.1207	2.2587	-0.0374	0.3099
	17.50	57.83	0.2001	1.280	2.29	0.48	0.0110	0.1186	2.2459	-0.0284	0.3118
	17.99	57.67	0.1998	1.278	2.19	0.46	0.0105	0.1085	2.2077	-0.0233	0.3110
	18.52	57.68	0.1999	1.278	2.20	0.46	0.0104	0.1085	2.1387	-0.0478	0.3214
	18.98	57.86	0.2002	1.280	2.20	0.46	0.0102	0.1073	2.1327	-0.0635	0.3409

Table C10. Aerodynamic Data Summary for Run 62 without TWICS.

Run No. (Configuration)	α_{u} (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
	-3.99	57.84	0.2001	1.285	1.51	0.31	0.0056	0.0493	0.4973	-0.2127	0.1515
	0.03	57.79	0.2000	1.283	1.52	0.31	0.0056	0.0497	0.9697	-0.2384	0.1513
	2.01	57.68	0.1998	1.282	1.58	0.32	0.0060	0.0538	1.1584	-0.2253	0.1600
	4.01	57.86	0.2002	1.283	1.60	0.33	0.0063	0.0557	1.3225	-0.2074	0.1698
	6.02	57.57	0.1997	1.280	1.61	0.33	0.0065	0.0570	1.4866	-0.1873	0.1837
	7.00	57.84	0.2001	1.283	1.61	0.33	0.0064	0.0567	1.5619	-0.1763	0.1915
	7.99	57.82	0.2001	1.282	1.61	0.33	0.0064	0.0563	1.6483	-0.1662	0.2007
	9.00	57.88	0.2002	1.283	1.61	0.33	0.0064	0.0565	1.7272	-0.1551	0.2103
	10.00	57.99	0.2004	1.285	1.50	0.30	0.0054	0.0481	1.7786	-0.1392	0.2159
62	10.99	57.59	0.1997	1.280	1.51	0.30	0.0056	0.0495	1.8472	-0.1251	0.2245
	12.01	57.79	0.2000	1.282	1.51	0.30	0.0056	0.0492	1.9143	-0.1102	0.2339
(HELP-4C)	13.00	57.81	0.2001	1.282	1.52	0.30	0.0056	0.0492	1.9817	-0.0964	0.2436
	13.99	57.67	0.1998	1.281	1.52	0.30	0.0056	0.0497	2.0444	-0.0800	0.2527
	15.01	57.69	0.1999	1.281	1.57	0.32	0.0061	0.0537	2.1023	-0.0647	0.2642
	15.48	57.86	0.2002	1.283	1.61	0.33	0.0064	0.0564	2.1323	-0.0555	0.2701
	16.00	57.68	0.1998	1.280	1.55	0.31	0.0057	0.0512	2.1393	-0.0470	0.2839
	16.49	57.81	0.2001	1.282	1.59	0.32	0.0062	0.0550	2.1675	-0.0381	0.2914
	17.00	57.74	0.1999	1.281	1.61	0.33	0.0064	0.0566	2.1812	-0.0307	0.2966
	17.52	57.94	0.2003	1.283	1.61	0.33	0.0065	0.0567	2.1850	-0.0210	0.3013
	17.99	57.87	0.2002	1.282	1.60	0.33	0.0064	0.0563	2.1677	-0.0153	0.3036
	18.50	57.76	0.2000	1.281	1.52	0.30	0.0055	0.0489	2.1060	-0.0366	0.3128
	19.00	57.82	0.2001	1.281	1.52	0.31	0.0057	0.0498	2.0876	-0.0568	0.3352

Table C11. Aerodynamic Data Summary for Run 63 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
63 (HELP-6C)	-3.99	58.21	0.2003	1.359	2.06	0.64	0.0158	0.1370	0.7423	-0.2687	0.1568
	0.03	58.17	0.2002	1.349	1.99	0.62	0.0153	0.1293	1.1608	-0.2771	0.1625
	2.02	57.81	0.1996	1.344	2.01	0.62	0.0153	0.1317	1.3419	-0.2644	0.1736
	4.01	58.14	0.2002	1.344	2.03	0.64	0.0159	0.1354	1.5068	-0.2484	0.1862
	6.00	58.15	0.2002	1.344	2.03	0.63	0.0157	0.1344	1.6609	-0.2253	0.2005
	7.00	57.91	0.1998	1.341	2.03	0.64	0.0159	0.1358	1.7498	-0.2158	0.2119
	7.99	58.24	0.2003	1.343	2.03	0.64	0.0158	0.1346	1.8274	-0.2066	0.2212
	9.00	57.88	0.1997	1.338	2.03	0.63	0.0158	0.1357	1.9095	-0.1951	0.2318
	10.00	58.30	0.2004	1.343	2.03	0.63	0.0154	0.1329	1.9809	-0.1818	0.2420
	11.01	58.14	0.2002	1.341	2.03	0.63	0.0157	0.1348	2.0526	-0.1686	0.2518
	12.01	57.89	0.1997	1.336	2.03	0.63	0.0158	0.1358	2.1257	-0.1550	0.2623
	12.98	58.04	0.2000	1.338	2.03	0.63	0.0158	0.1352	2.1843	-0.1410	0.2706
	13.99	58.09	0.2001	1.338	2.03	0.63	0.0156	0.1345	2.2398	-0.1258	0.2804
	15.01	57.89	0.1997	1.337	2.03	0.63	0.0158	0.1358	2.2859	-0.1078	0.2906
	15.49	58.16	0.2002	1.339	2.00	0.62	0.0153	0.1295	2.3152	-0.0945	0.2949
	16.00	58.15	0.2002	1.337	1.99	0.61	0.0151	0.1279	2.3031	-0.0864	0.3074
	16.49	58.09	0.2001	1.337	1.99	0.62	0.0153	0.1290	2.3185	-0.0779	0.3133
	17.00	57.85	0.1996	1.334	1.99	0.62	0.0154	0.1302	2.3184	-0.0684	0.3166
	17.50	58.12	0.2001	1.337	2.01	0.62	0.0152	0.1302	2.3126	-0.0608	0.3200
	17.99	58.17	0.2002	1.337	2.02	0.63	0.0154	0.1324	2.2797	-0.0606	0.3232
	18.50	58.22	0.2003	1.337	2.04	0.63	0.0156	0.1346	2.2191	-0.0936	0.3424
	19.00	58.21	0.2003	1.337	2.05	0.64	0.0158	0.1364	2.2160	-0.1006	0.3604

Table C12. Aerodynamic Data Summary for Run 64 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
64 (HELP-6C)	-3.99	58.17	0.2002	1.335	1.97	0.61	0.0152	0.1269	0.6953	-0.2718	0.1520
	0.03	58.14	0.2001	1.334	1.97	0.61	0.0150	0.1258	1.1363	-0.2889	0.1575
	2.01	57.92	0.1997	1.332	1.97	0.61	0.0151	0.1267	1.3091	-0.2768	0.1674
	4.01	58.03	0.1999	1.332	1.97	0.62	0.0154	0.1279	1.4736	-0.2602	0.1784
	6.00	57.97	0.1998	1.331	1.97	0.61	0.0151	0.1268	1.6330	-0.2385	0.1939
	7.00	57.99	0.1999	1.331	1.98	0.61	0.0152	0.1275	1.7174	-0.2285	0.2039
	7.99	57.97	0.1998	1.331	2.03	0.63	0.0159	0.1356	1.8105	-0.2212	0.2151
	9.00	58.43	0.2006	1.336	2.04	0.64	0.0158	0.1354	1.8879	-0.2089	0.2250
	10.00	58.41	0.2006	1.335	2.04	0.63	0.0156	0.1350	1.9607	-0.1961	0.2349
	10.99	58.34	0.2005	1.334	2.04	0.64	0.0158	0.1363	2.0321	-0.1826	0.2444
	11.99	57.83	0.1995	1.328	1.95	0.61	0.0151	0.1253	2.0829	-0.1647	0.2518
	13.00	58.13	0.2001	1.331	1.96	0.61	0.0149	0.1243	2.1456	-0.1491	0.2611
	13.97	58.29	0.2004	1.332	1.96	0.61	0.0149	0.1242	2.1973	-0.1344	0.2691
	15.01	58.22	0.2003	1.331	1.96	0.61	0.0150	0.1249	2.2497	-0.1173	0.2799
	15.49	58.08	0.2000	1.330	1.96	0.61	0.0150	0.1255	2.2797	-0.1068	0.2853
	16.00	58.14	0.2001	1.329	2.06	0.64	0.0157	0.1382	2.2992	-0.1017	0.3017
	16.47	58.19	0.2002	1.330	2.06	0.64	0.0156	0.1377	2.3145	-0.0939	0.3073
	17.00	58.03	0.1999	1.328	2.06	0.64	0.0160	0.1398	2.3160	-0.0855	0.3113
	17.50	58.26	0.2003	1.330	2.06	0.64	0.0157	0.1380	2.3089	-0.0778	0.3148
	18.01	58.09	0.2000	1.328	2.02	0.64	0.0159	0.1357	2.2702	-0.0761	0.3171
	18.48	57.94	0.1997	1.327	1.96	0.61	0.0153	0.1273	2.2009	-0.1056	0.3311
	19.02	57.89	0.1996	1.326	1.97	0.61	0.0153	0.1277	2.1900	-0.1182	0.3513

Table C13. Aerodynamic Data Summary for Run 66 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
66 (AFC-off, M_∞ = 0.15)	-3.97	33.14	0.1502	1.030	0.99	0	0	0	0.2903	-0.2060	0.1396
	0.03	33.04	0.1499	1.026	0.99	0	0	0	0.7950	-0.2207	0.1365
	2.01	32.92	0.1497	1.024	0.99	0	0	0	0.9704	-0.2100	0.1396
	4.01	32.90	0.1496	1.023	0.99	0	0	0	1.1343	-0.1922	0.1463
	6.00	33.04	0.1499	1.025	0.99	0	0	0	1.2961	-0.1717	0.1567
	7.00	32.94	0.1497	1.024	0.99	0	0	0	1.3715	-0.1610	0.1628
	8.01	32.95	0.1497	1.024	0.99	0	0	0	1.4513	-0.1493	0.1699
	8.98	33.07	0.1500	1.025	0.99	0	0	0	1.5313	-0.1391	0.1781
	9.98	32.96	0.1497	1.023	0.99	0	0	0	1.6080	-0.1282	0.1866
	10.99	33.01	0.1499	1.024	0.99	0	0	0	1.6797	-0.1156	0.1955
	11.99	32.98	0.1498	1.023	0.99	0	0	0	1.7503	-0.0997	0.2049
	13.00	33.13	0.1501	1.026	0.99	0	0	0	1.8149	-0.0859	0.2148
	14.01	33.05	0.1500	1.024	0.99	0	0	0	1.8773	-0.0716	0.2250
	14.99	33.06	0.1500	1.024	0.99	0	0	0	1.9379	-0.0563	0.2358
	15.51	33.12	0.1501	1.025	0.99	0	0	0	1.9685	-0.0480	0.2416
	16.00	33.03	0.1499	1.023	0.99	0	0	0	1.9991	-0.0395	0.2576
	16.49	33.01	0.1499	1.023	0.99	0	0	0	2.0289	-0.0310	0.2655
	16.98	33.03	0.1499	1.023	0.99	0	0	0	2.0573	-0.0221	0.2723
	17.50	33.09	0.1501	1.024	0.99	0	0	0	2.0820	-0.0129	0.2806
	17.99	33.06	0.1500	1.024	0.99	0	0	0	2.0924	-0.0038	0.2870
	18.50	33.21	0.1503	1.026	0.99	0	0	0	2.0968	0.0003	0.2945
	19.00	33.03	0.1499	1.023	0.99	0	0	0	2.0908	-0.0011	0.3021

Table C14. Aerodynamic Data Summary for Run 67 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
67 (HELP-8C, M_∞ = 0.15)	-3.99	33.04	0.1499	1.023	1.89	0.79	0.0361	0.3691	1.0267	-0.3661	0.1620
	0.03	32.94	0.1497	1.021	1.90	0.79	0.0361	0.3705	1.4181	-0.3593	0.1784
	2.01	33.10	0.1501	1.024	1.89	0.80	0.0363	0.3694	1.5727	-0.3436	0.1896
	4.03	33.21	0.1503	1.025	1.90	0.79	0.0360	0.3668	1.7305	-0.3255	0.2036
	6.00	33.05	0.1500	1.023	1.90	0.79	0.0360	0.3686	1.8935	-0.3053	0.2231
	6.98	33.03	0.1499	1.023	1.89	0.79	0.0355	0.3659	1.9719	-0.2954	0.2330
	8.01	33.11	0.1501	1.023	1.88	0.77	0.0348	0.3569	2.0499	-0.2841	0.2435
	9.00	33.16	0.1502	1.024	1.88	0.78	0.0356	0.3603	2.1251	-0.2722	0.2544
	10.00	32.98	0.1498	1.021	1.88	0.77	0.0348	0.3570	2.1983	-0.2591	0.2654
	10.97	33.13	0.1502	1.023	1.88	0.78	0.0356	0.3592	2.2615	-0.2460	0.2746
	12.01	33.18	0.1503	1.023	1.88	0.78	0.0355	0.3581	2.3238	-0.2303	0.2846
	12.98	33.03	0.1499	1.021	1.87	0.78	0.0355	0.3574	2.3682	-0.2147	0.2921
	13.99	33.13	0.1502	1.023	1.87	0.78	0.0358	0.3567	2.4177	-0.1979	0.3021
	15.01	33.05	0.1500	1.022	1.91	0.79	0.0363	0.3698	2.4830	-0.1791	0.3274
	15.48	33.11	0.1501	1.022	1.87	0.78	0.0354	0.3556	2.4905	-0.1686	0.3310
	16.00	33.05	0.1500	1.021	1.88	0.77	0.0350	0.3576	2.4955	-0.1620	0.3345
	16.49	33.06	0.1500	1.021	1.89	0.78	0.0359	0.3630	2.4941	-0.1542	0.3382
	16.98	32.99	0.1498	1.020	1.89	0.78	0.0354	0.3615	2.4814	-0.1451	0.3396
	17.50	33.16	0.1502	1.023	1.88	0.78	0.0352	0.3571	2.4588	-0.1381	0.3409
	18.01	33.11	0.1501	1.022	1.89	0.78	0.0350	0.3582	2.4080	-0.1447	0.3446
	18.50	33.04	0.1500	1.021	1.88	0.77	0.0347	0.3560	2.3565	-0.1721	0.3639
	19.02	33.07	0.1500	1.021	1.89	0.78	0.0355	0.3615	2.3492	-0.1719	0.3777

Table C15. Aerodynamic Data Summary for Run 68 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
68 (HELP-8C, M_∞ = 0.15)	-3.99	33.25	0.1504	1.024	1.50	0.61	0.0226	0.2220	0.8364	-0.3265	0.1567
	0.05	33.15	0.1502	1.022	1.49	0.61	0.0227	0.2217	1.2498	-0.3291	0.1653
	4.03	32.96	0.1498	1.020	1.49	0.60	0.0226	0.2211	1.5801	-0.2988	0.1887
	6.00	33.02	0.1499	1.020	1.49	0.60	0.0223	0.2202	1.7292	-0.2764	0.2033
	6.98	32.97	0.1498	1.019	1.49	0.60	0.0222	0.2195	1.8163	-0.2661	0.2141
	8.01	33.16	0.1502	1.022	1.50	0.61	0.0229	0.2231	1.8966	-0.2554	0.2243
	9.00	33.05	0.1500	1.021	1.48	0.59	0.0215	0.2134	1.9608	-0.2427	0.2326
	10.00	33.06	0.1500	1.021	1.50	0.60	0.0224	0.2204	2.0420	-0.2315	0.2440
	10.99	32.89	0.1496	1.018	1.50	0.60	0.0227	0.2234	2.1150	-0.2184	0.2546
	11.99	33.05	0.1500	1.021	1.48	0.59	0.0219	0.2159	2.1730	-0.2033	0.2629
	13.00	33.08	0.1500	1.021	1.50	0.60	0.0224	0.2211	2.2432	-0.1909	0.2740
	14.01	33.08	0.1500	1.021	1.50	0.60	0.0224	0.2206	2.2949	-0.1742	0.2839
	14.99	33.04	0.1499	1.020	1.50	0.60	0.0224	0.2205	2.3449	-0.1582	0.2945
	15.49	33.05	0.1500	1.020	1.50	0.60	0.0224	0.2205	2.3611	-0.1483	0.3103
	16.00	33.06	0.1500	1.020	1.50	0.60	0.0222	0.2196	2.3807	-0.1404	0.3157
	16.47	33.09	0.1501	1.021	1.50	0.60	0.0222	0.2192	2.3875	-0.1319	0.3197
	16.98	33.04	0.1499	1.020	1.50	0.60	0.0222	0.2198	2.3864	-0.1239	0.3235
	17.50	33.16	0.1502	1.022	1.50	0.60	0.0225	0.2215	2.3778	-0.1169	0.3267
	17.99	33.11	0.1501	1.020	1.50	0.60	0.0225	0.2215	2.3406	-0.1191	0.3306
	18.50	33.00	0.1499	1.019	1.50	0.60	0.0226	0.2232	2.2866	-0.1485	0.3510
	19.00	33.08	0.1500	1.020	1.50	0.60	0.0224	0.2210	2.2757	-0.1532	0.3672

Table C16. Aerodynamic Data Summary for Run 69 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
69 (HELP-8C, M_∞ = 0.15)	0.01	32.80	0.1494	1.018	1.79	0.72	0.0303	0.3207	1.3873	-0.3387	0.1770
	4.01	32.07	0.1477	1.007	1.72	0.68	0.0287	0.3020	1.6854	-0.3028	0.2004
	7.97	33.05	0.1500	1.022	1.72	0.69	0.0280	0.2899	1.9910	-0.2603	0.2382
	12.01	33.08	0.1500	1.022	1.73	0.69	0.0280	0.2921	2.2729	-0.2070	0.2803
	16.00	32.97	0.1498	1.020	1.75	0.70	0.0288	0.3020	2.4546	-0.1364	0.3293

Table C17. Aerodynamic Data Summary for Run 71 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
71 (HELP-10C)	-3.99	57.88	0.2001	1.365	1.53	0.76	0.0173	0.1220	0.7395	-0.3458	0.1487
	0.03	57.84	0.2001	1.363	1.53	0.77	0.0178	0.1235	1.1903	-0.3674	0.1572
	2.02	57.68	0.1998	1.360	1.53	0.77	0.0177	0.1240	1.3614	-0.3508	0.1670
	4.01	57.73	0.1999	1.361	1.54	0.77	0.0179	0.1243	1.5267	-0.3340	0.1791
	6.00	57.64	0.1997	1.359	1.54	0.77	0.0177	0.1241	1.6813	-0.3115	0.1932
	7.00	57.83	0.2000	1.361	1.55	0.77	0.0178	0.1251	1.7669	-0.3012	0.2034
	8.01	58.01	0.2004	1.361	1.54	0.77	0.0175	0.1231	1.8425	-0.2874	0.2128
	9.00	57.58	0.1996	1.356	1.54	0.77	0.0179	0.1257	1.9194	-0.2734	0.2221
	10.00	57.63	0.1997	1.356	1.54	0.77	0.0179	0.1256	1.9938	-0.2605	0.2317
	10.99	57.88	0.2001	1.358	1.54	0.77	0.0177	0.1241	2.0561	-0.2452	0.2404
	12.01	57.76	0.1999	1.355	1.54	0.77	0.0178	0.1245	2.1253	-0.2308	0.2504
	13.00	57.81	0.2000	1.355	1.54	0.77	0.0179	0.1246	2.1872	-0.2155	0.2597
	14.01	57.85	0.2001	1.356	1.54	0.77	0.0177	0.1238	2.2476	-0.1997	0.2700
	15.01	57.69	0.1998	1.354	1.54	0.77	0.0176	0.1240	2.2960	-0.1839	0.2795
	15.49	57.72	0.1998	1.354	1.54	0.76	0.0176	0.1237	2.3277	-0.1745	0.2847
	16.02	57.71	0.1998	1.351	1.45	0.71	0.0154	0.1083	2.3180	-0.1522	0.2851
	16.49	57.56	0.1996	1.349	1.44	0.70	0.0152	0.1068	2.3064	-0.1445	0.2980
	16.98	57.61	0.1997	1.350	1.43	0.69	0.0148	0.1048	2.3129	-0.1340	0.3023
	17.52	58.09	0.2005	1.355	1.43	0.69	0.0145	0.1026	2.3135	-0.1242	0.3070
	17.99	58.06	0.2005	1.354	1.43	0.69	0.0145	0.1027	2.2917	-0.1212	0.3106
	18.50	57.72	0.1999	1.351	1.43	0.70	0.0149	0.1049	2.2291	-0.1608	0.3356
	19.02	57.69	0.1998	1.350	1.43	0.70	0.0149	0.1050	2.2204	-0.1679	0.3544

Table C18. Aerodynamic Data Summary for Run 72 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
72 (HELP-10C)	-3.99	58.01	0.2006	1.349	1.67	0.79	0.0180	0.1378	0.8176	-0.3440	0.1517
	0.01	57.92	0.2005	1.346	1.67	0.79	0.0179	0.1375	1.2386	-0.3557	0.1622
	2.02	57.93	0.2005	1.347	1.67	0.79	0.0180	0.1378	1.4082	-0.3373	0.1727
	4.01	57.44	0.1996	1.339	1.67	0.80	0.0184	0.1407	1.5708	-0.3192	0.1850
	6.00	57.44	0.1996	1.338	1.67	0.79	0.0180	0.1394	1.7232	-0.2953	0.1995
	7.00	57.37	0.1995	1.337	1.67	0.79	0.0181	0.1401	1.8060	-0.2824	0.2095
	8.01	57.52	0.1998	1.335	1.67	0.78	0.0176	0.1381	1.8853	-0.2714	0.2200
	9.00	57.57	0.1999	1.336	1.67	0.79	0.0181	0.1398	1.9585	-0.2567	0.2287
	10.00	57.66	0.2000	1.336	1.68	0.79	0.0182	0.1402	2.0300	-0.2416	0.2387
	10.99	57.72	0.2002	1.337	1.67	0.80	0.0185	0.1408	2.0920	-0.2238	0.2472
	12.01	57.83	0.2004	1.336	1.68	0.79	0.0179	0.1391	2.1580	-0.2066	0.2568
	13.00	57.42	0.1996	1.332	1.68	0.79	0.0180	0.1402	2.2164	-0.1893	0.2658
	14.01	57.39	0.1996	1.331	1.68	0.78	0.0177	0.1398	2.2644	-0.1702	0.2743
	15.01	57.70	0.2001	1.335	1.68	0.79	0.0178	0.1394	2.3089	-0.1486	0.2836
	15.48	57.68	0.2001	1.335	1.68	0.79	0.0180	0.1397	2.3385	-0.1359	0.2883
	16.00	57.58	0.1999	1.332	1.69	0.79	0.0180	0.1420	2.3376	-0.1284	0.3016
	16.49	57.47	0.1997	1.330	1.69	0.78	0.0177	0.1407	2.3444	-0.1199	0.3056
	17.02	57.64	0.2000	1.332	1.69	0.79	0.0178	0.1403	2.3452	-0.1107	0.3099
	17.48	57.59	0.1999	1.331	1.69	0.79	0.0180	0.1413	2.3398	-0.1050	0.3122
	18.01	57.56	0.1999	1.330	1.69	0.80	0.0183	0.1432	2.3022	-0.1078	0.3160
	18.50	57.70	0.2002	1.331	1.69	0.78	0.0175	0.1396	2.2474	-0.1398	0.3351
	19.00	57.42	0.1997	1.328	1.69	0.79	0.0181	0.1426	2.2414	-0.1516	0.3561

Table C19. Aerodynamic Data Summary for Run 73 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
	-3.99	57.63	0.2001	1.324	1.99	0.79	0.0198	0.1669	0.8270	-0.3155	0.1574
	0.01	57.31	0.1995	1.320	1.99	0.79	0.0197	0.1674	1.2481	-0.3227	0.1673
	2.01	57.43	0.1997	1.321	1.99	0.79	0.0197	0.1665	1.4150	-0.3079	0.1777
	4.03	57.46	0.1998	1.322	1.99	0.79	0.0200	0.1681	1.5783	-0.2894	0.1905
	6.02	57.38	0.1996	1.320	1.99	0.79	0.0197	0.1672	1.7326	-0.2664	0.2059
	7.00	57.34	0.1996	1.319	2.00	0.78	0.0195	0.1669	1.8199	-0.2572	0.2169
	8.01	57.44	0.1998	1.321	1.99	0.78	0.0195	0.1659	1.8991	-0.2456	0.2269
	9.00	57.72	0.2003	1.323	1.99	0.79	0.0196	0.1656	1.9775	-0.2347	0.2370
	10.00	57.79	0.2004	1.323	1.99	0.78	0.0194	0.1648	2.0481	-0.2212	0.2470
73	11.01	57.49	0.1998	1.320	1.99	0.79	0.0196	0.1665	2.1231	-0.2082	0.2578
	12.01	57.65	0.2001	1.321	1.99	0.79	0.0198	0.1673	2.1881	-0.1935	0.2674
(HELP-8C)	13.00	57.63	0.2001	1.321	1.99	0.79	0.0196	0.1656	2.2459	-0.1786	0.2764
	14.01	57.59	0.2000	1.320	1.99	0.78	0.0194	0.1652	2.2977	-0.1627	0.2858
	15.01	57.76	0.2003	1.323	1.99	0.78	0.0194	0.1644	2.3583	-0.1427	0.2970
	15.49	57.73	0.2003	1.323	1.99	0.79	0.0197	0.1661	2.3807	-0.1338	0.3015
	16.02	57.74	0.2003	1.323	1.99	0.78	0.0195	0.1652	2.3725	-0.1257	0.3141
	16.49	57.74	0.2003	1.322	2.00	0.79	0.0198	0.1669	2.3776	-0.1180	0.3174
	17.02	57.42	0.1997	1.318	1.99	0.78	0.0196	0.1666	2.3756	-0.1097	0.3210
	17.48	57.68	0.2002	1.320	2.00	0.80	0.0200	0.1685	2.3643	-0.1022	0.3227
	18.01	57.58	0.2000	1.319	1.99	0.79	0.0197	0.1670	2.3114	-0.1079	0.3273
	18.48	57.61	0.2000	1.320	1.99	0.79	0.0197	0.1669	2.2604	-0.1418	0.3494
	19.00	57.34	0.1996	1.316	1.99	0.78	0.0195	0.1663	2.2564	-0.1354	0.3607

Table C20. Aerodynamic Data Summary for Run 74 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
	-4.01	57.59	0.2000	1.317	1.0	0	0	0	0.2735	-0.1913	0.1420
	0.03	57.43	0.1998	1.316	1.0	0	0	0	0.8013	-0.2269	0.1374
	2.01	57.47	0.1998	1.315	1.0	0	0	0	0.9713	-0.2124	0.1405
	4.01	57.60	0.2001	1.318	1.0	0	0	0	1.1360	-0.1937	0.1468
	6.00	57.62	0.2001	1.318	1.0	0	0	0	1.2932	-0.1734	0.1565
	7.00	57.59	0.2001	1.318	1.0	0	0	0	1.3730	-0.1618	0.1630
	8.01	57.51	0.1999	1.315	1.0	0	0	0	1.4510	-0.1500	0.1692
	9.00	57.43	0.1998	1.314	1.0	0	0	0	1.5342	-0.1402	0.1780
	10.00	57.74	0.2003	1.318	1.0	0	0	0	1.6103	-0.1288	0.1872
74	10.99	57.53	0.2000	1.315	1.0	0	0	0	1.6824	-0.1166	0.1958
	12.01	57.46	0.1999	1.314	1.0	0	0	0	1.7525	-0.1021	0.2053
(AFC-off, repeat)	13.00	57.37	0.1997	1.312	1.0	0	0	0	1.8199	-0.0880	0.2153
	13.99	57.27	0.1995	1.311	1.0	0	0	0	1.8782	-0.0733	0.2245
	15.01	57.64	0.2002	1.314	1.0	0	0	0	1.9422	-0.0591	0.2362
	15.49	57.52	0.2000	1.312	1.0	0	0	0	1.9729	-0.0523	0.2418
	16.02	57.21	0.1994	1.306	1.0	0	0	0	2.0030	-0.0431	0.2471
	16.49	57.89	0.2006	1.314	1.0	0	0	0	2.0326	-0.0352	0.2653
	17.00	57.23	0.1995	1.307	1.0	0	0	0	2.0619	-0.0273	0.2727
	17.52	57.47	0.1999	1.309	1.0	0	0	0	2.0863	-0.0180	0.2811
	17.99	57.68	0.2003	1.311	1.0	0	0	0	2.0977	-0.0110	0.2872
	18.50	57.64	0.2002	1.312	1.0	0	0	0	2.0979	-0.0065	0.2932
	19.00	57.50	0.1999	1.309	1.0	0	0	0	2.0868	-0.0165	0.3053

Table C21. Aerodynamic Data Summary for Run 75 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
75 (HELP-10C)	-3.99	57.64	0.2002	1.309	1.24	0.55	0.0097	0.0721	0.5776	-0.3070	0.1405
	0.03	57.52	0.2000	1.308	1.28	0.58	0.0110	0.0795	1.0710	-0.3473	0.1461
	2.01	57.45	0.1999	1.306	1.28	0.59	0.0111	0.0801	1.2548	-0.3302	0.1561
	4.01	57.26	0.1996	1.305	1.25	0.55	0.0100	0.0741	1.3988	-0.3027	0.1652
	6.00	57.54	0.2001	1.307	1.25	0.56	0.0100	0.0740	1.5550	-0.2810	0.1773
	7.00	57.44	0.1999	1.306	1.25	0.56	0.0101	0.0745	1.6294	-0.2708	0.1841
	8.01	57.15	0.1994	1.302	1.25	0.56	0.0103	0.0759	1.7139	-0.2599	0.1943
	9.00	57.41	0.1999	1.305	1.25	0.55	0.0099	0.0734	1.7836	-0.2431	0.2024
	10.00	57.50	0.2000	1.301	1.28	0.58	0.0108	0.0789	1.8703	-0.2354	0.2134
	10.99	57.61	0.2002	1.306	1.25	0.55	0.0099	0.0736	1.9176	-0.2118	0.2197
	12.01	57.54	0.2001	1.305	1.28	0.59	0.0111	0.0802	2.0034	-0.2036	0.2321
	13.00	57.58	0.2002	1.306	1.26	0.56	0.0101	0.0745	2.0411	-0.1777	0.2373
	14.01	57.50	0.2000	1.305	1.26	0.56	0.0100	0.0744	2.1043	-0.1589	0.2477
	15.01	57.56	0.2001	1.305	1.26	0.56	0.0102	0.0750	2.1604	-0.1406	0.2590
	15.49	57.34	0.1997	1.302	1.26	0.55	0.0100	0.0746	2.1832	-0.1307	0.2632
	16.02	57.40	0.1999	1.302	1.26	0.55	0.0099	0.0746	2.2066	-0.1218	0.2794
	16.49	57.30	0.1997	1.300	1.27	0.56	0.0104	0.0771	2.2315	-0.1157	0.2862
	17.00	57.62	0.2003	1.304	1.28	0.57	0.0105	0.0779	2.2478	-0.1077	0.2916
	17.52	57.96	0.2009	1.308	1.29	0.58	0.0107	0.0786	2.2552	-0.1017	0.2970
	17.99	57.69	0.2004	1.305	1.29	0.58	0.0107	0.0791	2.2440	-0.0975	0.3007
	18.48	57.36	0.1998	1.301	1.29	0.58	0.0109	0.0805	2.1897	-0.1362	0.3239
	19.02	57.70	0.2004	1.304	1.29	0.58	0.0110	0.0802	2.1790	-0.1462	0.3449

Table C22. Aerodynamic Data Summary for Run 77 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
77 (HELP-10C-R1S)	-3.99	57.67	0.2001	1.366	1.24	0.44	0.0093	0.0576	0.5024	-0.2898	0.1338
	0.03	57.46	0.1998	1.363	1.26	0.45	0.0097	0.0601	0.9934	-0.3265	0.1345
	2.02	57.29	0.1994	1.360	1.27	0.46	0.0100	0.0616	1.1732	-0.3081	0.1432
	4.01	56.71	0.1984	1.353	1.27	0.46	0.0100	0.0624	1.3271	-0.2811	0.1536
	6.00	56.37	0.1978	1.349	1.27	0.46	0.0103	0.0637	1.4701	-0.2463	0.1644
	7.00	57.39	0.1996	1.361	1.24	0.43	0.0088	0.0562	1.5081	-0.2161	0.1670
	8.01	57.63	0.2001	1.363	1.24	0.43	0.0089	0.0563	1.5791	-0.1992	0.1747
	9.00	57.68	0.2002	1.363	1.24	0.43	0.0088	0.0562	1.6525	-0.1819	0.1826
	9.98	57.26	0.1994	1.358	1.24	0.43	0.0089	0.0570	1.7181	-0.1632	0.1916
	10.99	57.37	0.1996	1.359	1.25	0.43	0.0089	0.0572	1.7900	-0.1457	0.2018
	11.99	57.79	0.2003	1.363	1.26	0.44	0.0092	0.0582	1.8574	-0.1286	0.2115
	13.00	57.85	0.2004	1.364	1.27	0.46	0.0097	0.0603	1.9221	-0.1116	0.2218
	13.99	57.66	0.2001	1.361	1.28	0.46	0.0098	0.0613	1.9802	-0.0962	0.2319
	15.01	57.54	0.1999	1.360	1.28	0.46	0.0098	0.0616	2.0385	-0.0811	0.2438
	15.49	57.71	0.2002	1.361	1.28	0.46	0.0099	0.0619	2.0643	-0.0715	0.2492
	16.02	57.40	0.1997	1.357	1.28	0.46	0.0100	0.0625	2.0955	-0.0602	0.2548
	16.49	57.43	0.1997	1.357	1.24	0.43	0.0087	0.0560	2.1123	-0.0472	0.2589
	17.00	57.85	0.2005	1.361	1.24	0.43	0.0087	0.0559	2.1336	-0.0417	0.2777
	17.50	57.95	0.2006	1.362	1.25	0.43	0.0087	0.0559	2.1491	-0.0325	0.2835
	17.99	57.84	0.2004	1.361	1.25	0.43	0.0087	0.0562	2.1517	-0.0253	0.2884
	18.48	57.48	0.1998	1.356	1.25	0.43	0.0088	0.0569	2.1202	-0.0346	0.2955
	19.00	57.80	0.2004	1.359	1.25	0.43	0.0088	0.0565	2.0972	-0.0614	0.3216

Table C23. Aerodynamic Data Summary for Run 78 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
78 (HELP-10C-R1S)	-3.97	57.60	0.1999	1.361	1.51	0.60	0.0159	0.0952	0.6186	-0.3289	0.1411
	0.05	57.41	0.1996	1.357	1.51	0.60	0.0157	0.0945	1.0881	-0.3596	0.1462
	1.99	57.54	0.1998	1.360	1.51	0.60	0.0156	0.0942	1.2623	-0.3419	0.1556
	3.99	57.28	0.1994	1.357	1.51	0.60	0.0161	0.0964	1.4250	-0.3240	0.1665
	6.00	57.35	0.1995	1.357	1.50	0.60	0.0161	0.0958	1.5710	-0.2940	0.1784
	7.00	57.72	0.2001	1.361	1.50	0.59	0.0153	0.0927	1.6302	-0.2748	0.1843
	7.97	57.65	0.2000	1.360	1.50	0.59	0.0152	0.0923	1.7020	-0.2580	0.1923
	9.00	57.53	0.1998	1.358	1.51	0.60	0.0157	0.0949	1.7734	-0.2351	0.2010
	10.00	57.83	0.2003	1.361	1.52	0.61	0.0162	0.0963	1.8371	-0.2135	0.2096
	10.99	57.76	0.2002	1.360	1.50	0.60	0.0159	0.0945	1.8872	-0.1865	0.2168
	11.99	57.73	0.2002	1.360	1.51	0.59	0.0154	0.0935	1.9375	-0.1619	0.2245
	13.00	57.82	0.2003	1.361	1.51	0.58	0.0149	0.0919	1.9940	-0.1408	0.2344
	14.01	57.55	0.1998	1.357	1.51	0.58	0.0149	0.0925	2.0449	-0.1195	0.2439
	15.01	57.58	0.1999	1.358	1.51	0.58	0.0148	0.0924	2.0958	-0.1023	0.2553
	15.49	57.51	0.1998	1.356	1.51	0.60	0.0156	0.0946	2.1151	-0.0903	0.2594
	16.02	57.63	0.2000	1.356	1.52	0.61	0.0162	0.0967	2.1527	-0.0778	0.2656
	16.49	57.68	0.2001	1.356	1.51	0.59	0.0152	0.0931	2.1626	-0.0710	0.2817
	17.02	57.54	0.1998	1.355	1.51	0.60	0.0161	0.0959	2.1836	-0.0604	0.2878
	17.48	57.64	0.2000	1.356	1.51	0.60	0.0161	0.0954	2.1904	-0.0525	0.2919
	18.01	57.62	0.2000	1.355	1.50	0.60	0.0160	0.0951	2.1885	-0.0444	0.2966
	18.48	57.68	0.2001	1.356	1.25	0.43	0.0084	0.0557	2.1192	-0.0355	0.2980
	19.00	57.58	0.1999	1.355	1.32	0.47	0.0103	0.0658	2.1148	-0.0647	0.3252

Table C24. Aerodynamic Data Summary for Run 80 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
80 (HELP-10C-R1ENS)	-4.01	57.86	0.2004	1.365	1.51	0.67	0.0161	0.1063	0.6788	-0.3379	0.1439
	0.03	57.77	0.2002	1.363	1.51	0.68	0.0164	0.1069	1.1437	-0.3655	0.1510
	2.01	57.47	0.1997	1.359	1.53	0.69	0.0168	0.1111	1.3238	-0.3493	0.1613
	4.01	57.42	0.1996	1.358	1.53	0.69	0.0168	0.1106	1.4895	-0.3328	0.1728
	6.02	57.68	0.2000	1.360	1.52	0.68	0.0163	0.1074	1.6432	-0.3087	0.1864
	7.00	57.11	0.1990	1.353	1.53	0.69	0.0171	0.1119	1.7221	-0.2983	0.1957
	8.01	57.43	0.1996	1.357	1.52	0.68	0.0167	0.1099	1.8019	-0.2854	0.2050
	9.00	57.89	0.2004	1.362	1.52	0.68	0.0163	0.1074	1.8755	-0.2709	0.2138
	10.00	57.71	0.2001	1.360	1.52	0.68	0.0165	0.1083	1.9408	-0.2553	0.2225
	10.99	57.57	0.1998	1.358	1.51	0.67	0.0163	0.1068	2.0061	-0.2391	0.2307
	11.99	57.82	0.2003	1.361	1.51	0.67	0.0161	0.1061	2.0709	-0.2252	0.2400
	13.00	57.77	0.2002	1.360	1.56	0.70	0.0173	0.1137	2.1457	-0.2121	0.2516
	14.01	57.71	0.2001	1.359	1.54	0.69	0.0170	0.1117	2.2013	-0.1929	0.2609
	15.01	57.60	0.1999	1.358	1.53	0.69	0.0169	0.1107	2.2449	-0.1728	0.2700
	15.49	57.84	0.2003	1.360	1.54	0.69	0.0170	0.1115	2.2757	-0.1642	0.2754
	16.02	57.53	0.1998	1.357	1.55	0.69	0.0171	0.1126	2.3053	-0.1520	0.2808
	16.49	57.61	0.1999	1.357	1.55	0.70	0.0173	0.1135	2.3037	-0.1449	0.2957
	16.98	57.73	0.2001	1.358	1.55	0.69	0.0171	0.1122	2.3105	-0.1342	0.2997
	17.48	57.54	0.1998	1.356	1.54	0.68	0.0167	0.1106	2.3068	-0.1246	0.3023
	18.01	57.48	0.1997	1.354	1.55	0.69	0.0168	0.1117	2.2838	-0.1229	0.3076
	18.48	57.62	0.2000	1.356	1.55	0.69	0.0169	0.1119	2.2270	-0.1613	0.3313
	19.00	57.68	0.2000	1.356	1.55	0.69	0.0171	0.1125	2.2221	-0.1626	0.3477

Table C25. Aerodynamic Data Summary for Run 81 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
81 (HELP-10C-R1ENS)	-4.01	57.82	0.2003	1.351	1.76	0.80	0.0215	0.1470	0.7646	-0.3572	0.1483
	0.05	57.43	0.1996	1.347	1.77	0.81	0.0224	0.1518	1.2176	-0.3767	0.1582
	2.01	57.40	0.1996	1.345	1.75	0.80	0.0218	0.1482	1.3816	-0.3590	0.1672
	4.01	57.80	0.2003	1.350	1.76	0.80	0.0214	0.1468	1.5458	-0.3413	0.1788
	6.02	57.45	0.1997	1.345	1.75	0.80	0.0221	0.1490	1.7002	-0.3186	0.1935
	7.00	57.47	0.1997	1.346	1.76	0.80	0.0218	0.1487	1.7797	-0.3076	0.2032
	8.01	57.23	0.1993	1.343	1.76	0.80	0.0221	0.1504	1.8635	-0.2962	0.2133
	9.00	57.58	0.1999	1.347	1.77	0.80	0.0218	0.1486	1.9349	-0.2815	0.2221
	10.00	57.50	0.1997	1.345	1.77	0.80	0.0218	0.1490	2.0052	-0.2675	0.2316
	10.99	57.58	0.1999	1.347	1.77	0.80	0.0221	0.1498	2.0756	-0.2544	0.2407
	12.01	57.75	0.2002	1.348	1.76	0.80	0.0221	0.1488	2.1397	-0.2385	0.2509
	13.00	57.82	0.2003	1.349	1.76	0.79	0.0215	0.1461	2.1999	-0.2233	0.2596
	13.99	57.72	0.2001	1.348	1.76	0.80	0.0219	0.1475	2.2641	-0.2071	0.2698
	15.01	57.63	0.2000	1.347	1.77	0.80	0.0219	0.1485	2.3084	-0.1905	0.2795
	15.48	57.71	0.2001	1.348	1.77	0.80	0.0218	0.1479	2.3443	-0.1788	0.2853
	16.00	57.57	0.1999	1.346	1.77	0.80	0.0217	0.1482	2.3629	-0.1693	0.2888
	16.49	57.53	0.1998	1.344	1.77	0.80	0.0220	0.1493	2.3559	-0.1629	0.3041
	17.00	57.61	0.1999	1.345	1.76	0.79	0.0217	0.1476	2.3631	-0.1527	0.3086
	17.48	57.37	0.1995	1.342	1.76	0.79	0.0217	0.1480	2.3589	-0.1444	0.3111
	17.99	57.71	0.2001	1.345	1.77	0.80	0.0222	0.1491	2.3171	-0.1468	0.3159
	18.48	57.71	0.2001	1.346	1.76	0.79	0.0213	0.1453	2.2659	-0.1777	0.3394
	18.98	57.62	0.1999	1.344	1.77	0.79	0.0217	0.1475	2.2625	-0.1786	0.3549

Table C26. Aerodynamic Data Summary for Run 82 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
82 (HELP-10C-R1ENS-ST)	-4.01	57.94	0.2005	1.354	1.83	0.78	0.0194	0.1496	0.8071	-0.3518	0.1525
	0.03	57.86	0.2003	1.351	1.83	0.79	0.0196	0.1509	1.2381	-0.3679	0.1624
	1.99	57.60	0.1999	1.348	1.84	0.79	0.0197	0.1526	1.4016	-0.3508	0.1726
	4.01	57.51	0.1997	1.347	1.84	0.79	0.0199	0.1537	1.5640	-0.3307	0.1848
	6.02	57.88	0.2004	1.351	1.84	0.79	0.0197	0.1522	1.7199	-0.3069	0.1994
	7.00	57.39	0.1995	1.345	1.84	0.79	0.0198	0.1540	1.7963	-0.2943	0.2090
	8.03	57.54	0.1998	1.346	1.84	0.79	0.0197	0.1532	1.8762	-0.2807	0.2191
	9.00	57.73	0.2001	1.349	1.85	0.79	0.0198	0.1539	1.9454	-0.2665	0.2272
	10.00	57.74	0.2001	1.349	1.85	0.80	0.0199	0.1543	2.0153	-0.2529	0.2365
	11.01	57.39	0.1995	1.344	1.84	0.80	0.0202	0.1552	2.0811	-0.2345	0.2465
	11.99	57.63	0.1999	1.347	1.83	0.79	0.0200	0.1531	2.1423	-0.2166	0.2544
	13.00	57.47	0.1996	1.345	1.84	0.79	0.0200	0.1542	2.2015	-0.1977	0.2636
	13.99	57.64	0.1999	1.347	1.84	0.79	0.0197	0.1531	2.2555	-0.1760	0.2719
	15.01	57.64	0.1999	1.347	1.85	0.80	0.0202	0.1559	2.2950	-0.1557	0.2808
	15.49	57.56	0.1998	1.346	1.85	0.79	0.0198	0.1545	2.3251	-0.1424	0.2861
	16.02	57.75	0.2001	1.348	1.85	0.79	0.0197	0.1531	2.3207	-0.1313	0.2958
	16.49	57.65	0.1999	1.346	1.84	0.79	0.0199	0.1535	2.3273	-0.1212	0.3029
	17.00	57.48	0.1996	1.344	1.84	0.79	0.0196	0.1528	2.3346	-0.1125	0.3075
	17.50	57.63	0.1999	1.346	1.84	0.78	0.0195	0.1519	2.3310	-0.1035	0.3098
	17.99	57.81	0.2002	1.347	1.85	0.79	0.0196	0.1528	2.2919	-0.1071	0.3140
	18.50	57.51	0.1997	1.344	1.85	0.80	0.0201	0.1559	2.2356	-0.1463	0.3374
	19.00	57.56	0.1998	1.344	1.85	0.79	0.0200	0.1551	2.2359	-0.1453	0.3518

Table C27. Aerodynamic Data Summary for Run 85 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
85 (AFC-off-R1VGs)	-3.99	58.53	0.2001	1.447	1.0	0	0	0	0.2802	-0.1883	0.1389
	0.03	58.57	0.2002	1.443	1.0	0	0	0	0.7937	-0.2248	0.1324
	1.99	58.41	0.1999	1.440	1.0	0	0	0	0.9644	-0.2097	0.1366
	4.01	58.36	0.1998	1.438	1.0	0	0	0	1.1292	-0.1891	0.1435
	6.02	58.55	0.2002	1.439	1.0	0	0	0	1.2920	-0.1698	0.1548
	7.00	58.33	0.1998	1.435	1.0	0	0	0	1.3696	-0.1584	0.1608
	8.01	58.51	0.2001	1.436	1.0	0	0	0	1.4459	-0.1470	0.1676
	9.00	58.56	0.2002	1.436	1.0	0	0	0	1.5273	-0.1371	0.1762
	10.00	58.64	0.2003	1.435	1.0	0	0	0	1.6039	-0.1257	0.1850
	11.01	58.42	0.1999	1.431	1.0	0	0	0	1.6787	-0.1114	0.1946
	12.01	58.23	0.1996	1.429	1.0	0	0	0	1.7461	-0.0979	0.2034
	13.00	58.46	0.2000	1.431	1.0	0	0	0	1.8125	-0.0839	0.2131
	13.99	58.53	0.2001	1.431	1.0	0	0	0	1.8726	-0.0715	0.2226
	15.01	58.14	0.1994	1.425	1.0	0	0	0	1.9356	-0.0567	0.2340
	15.49	58.29	0.1997	1.426	1.0	0	0	0	1.9624	-0.0494	0.2392
	16.02	58.31	0.1997	1.426	1.0	0	0	0	1.9968	-0.0411	0.2457
	16.49	58.32	0.1997	1.426	1.0	0	0	0	2.0228	-0.0330	0.2510
	17.02	58.54	0.2001	1.427	1.0	0	0	0	2.0620	-0.0251	0.2723
	17.50	58.53	0.2001	1.427	1.0	0	0	0	2.0821	-0.0180	0.2795
	17.99	58.58	0.2002	1.427	1.0	0	0	0	2.0906	-0.0120	0.2858
	18.50	58.65	0.2003	1.427	1.0	0	0	0	2.0871	-0.0088	0.2923
	19.00	58.62	0.2002	1.427	1.0	0	0	0	2.0716	-0.0197	0.3050

Table C28. Aerodynamic Data Summary for Run 86 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
86 (HELP-10C-R1S+R1VGs)	-3.99	58.54	0.2001	1.415	1.23	0.44	0.0088	0.0556	0.5152	-0.2818	0.1382
	0.03	58.51	0.2000	1.413	1.29	0.48	0.0104	0.0637	1.0261	-0.3311	0.1418
	2.01	58.31	0.1997	1.411	1.30	0.50	0.0110	0.0666	1.2014	-0.3074	0.1506
	3.99	58.39	0.1998	1.411	1.30	0.50	0.0109	0.0663	1.3507	-0.2793	0.1600
	6.02	58.49	0.2000	1.413	1.30	0.49	0.0107	0.0653	1.4880	-0.2464	0.1702
	7.00	58.31	0.1997	1.411	1.27	0.47	0.0100	0.0619	1.5401	-0.2257	0.1750
	8.01	58.43	0.1999	1.410	1.27	0.47	0.0097	0.0609	1.6150	-0.2098	0.1825
	9.02	58.24	0.1996	1.407	1.27	0.47	0.0099	0.0616	1.6887	-0.1935	0.1920
	10.00	58.46	0.2000	1.410	1.27	0.47	0.0099	0.0614	1.7502	-0.1723	0.2001
	11.01	58.38	0.1998	1.409	1.28	0.47	0.0099	0.0620	1.8218	-0.1575	0.2102
	12.01	58.24	0.1996	1.407	1.29	0.48	0.0102	0.0636	1.8864	-0.1431	0.2196
	13.00	58.60	0.2002	1.411	1.30	0.48	0.0104	0.0643	1.9533	-0.1299	0.2299
	14.01	58.43	0.1999	1.409	1.30	0.49	0.0106	0.0653	2.0166	-0.1138	0.2424
	15.01	58.48	0.2000	1.409	1.31	0.49	0.0107	0.0658	2.0722	-0.0969	0.2535
	15.49	58.45	0.1999	1.408	1.31	0.49	0.0107	0.0657	2.0967	-0.0896	0.2585
	16.02	58.39	0.1998	1.407	1.31	0.49	0.0107	0.0657	2.1258	-0.0796	0.2625
	16.49	58.41	0.1999	1.407	1.30	0.49	0.0108	0.0658	2.1515	-0.0704	0.2673
	17.00	58.60	0.2002	1.408	1.27	0.47	0.0097	0.0606	2.1605	-0.0607	0.2846
	17.50	58.51	0.2000	1.406	1.27	0.47	0.0097	0.0608	2.1707	-0.0561	0.2903
	18.01	58.42	0.1999	1.405	1.28	0.47	0.0097	0.0609	2.1734	-0.0514	0.2960
	18.48	58.39	0.1998	1.404	1.28	0.47	0.0099	0.0614	2.1431	-0.0617	0.3043
	19.00	58.49	0.2000	1.405	1.28	0.47	0.0098	0.0609	2.1284	-0.0839	0.3283

Table C29. Aerodynamic Data Summary for Run 87 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
87 (HELP-10C-R1S+R1VGs)	-3.99	58.52	0.2001	1.402	1.52	0.62	0.0164	0.0963	0.6436	-0.3261	0.1436
	0.03	58.33	0.1997	1.399	1.52	0.61	0.0161	0.0959	1.1185	-0.3571	0.1506
	2.02	58.56	0.2001	1.401	1.52	0.61	0.0161	0.0958	1.2833	-0.3379	0.1590
	4.01	58.10	0.1993	1.396	1.52	0.62	0.0163	0.0972	1.4369	-0.3163	0.1696
	6.00	58.42	0.1999	1.400	1.53	0.62	0.0163	0.0969	1.5784	-0.2866	0.1812
	7.00	58.68	0.2004	1.403	1.53	0.62	0.0162	0.0962	1.6473	-0.2706	0.1886
	8.01	58.31	0.1997	1.398	1.51	0.61	0.0162	0.0958	1.7238	-0.2535	0.1975
	9.02	58.62	0.2002	1.401	1.48	0.59	0.0152	0.0900	1.7762	-0.2276	0.2044
	10.00	58.24	0.1996	1.396	1.48	0.59	0.0152	0.0908	1.8420	-0.2080	0.2130
	11.01	58.31	0.1997	1.397	1.49	0.59	0.0152	0.0910	1.9039	-0.1897	0.2218
	12.01	58.68	0.2003	1.402	1.49	0.59	0.0151	0.0901	1.9582	-0.1706	0.2297
	13.00	58.57	0.2002	1.401	1.49	0.59	0.0151	0.0905	2.0110	-0.1547	0.2386
	13.99	58.50	0.2000	1.400	1.49	0.60	0.0153	0.0913	2.0694	-0.1360	0.2495
	15.01	58.45	0.1999	1.399	1.49	0.60	0.0153	0.0914	2.1212	-0.1184	0.2610
	15.49	58.63	0.2003	1.400	1.49	0.60	0.0153	0.0911	2.1454	-0.1105	0.2653
	16.02	58.39	0.1998	1.398	1.50	0.60	0.0153	0.0923	2.1779	-0.0988	0.2701
	16.49	58.65	0.2003	1.400	1.51	0.60	0.0154	0.0929	2.2053	-0.0921	0.2755
	17.00	58.24	0.1996	1.395	1.53	0.61	0.0159	0.0960	2.2183	-0.0891	0.2943
	17.52	58.61	0.2002	1.400	1.53	0.62	0.0162	0.0970	2.2258	-0.0838	0.2999
	17.97	58.44	0.1999	1.397	1.54	0.62	0.0164	0.0984	2.2241	-0.0795	0.3041
	18.50	58.35	0.1998	1.395	1.54	0.62	0.0162	0.0981	2.1820	-0.0947	0.3150
	19.00	58.60	0.2002	1.399	1.54	0.62	0.0163	0.0979	2.1749	-0.1041	0.3343

Table C30. Aerodynamic Data Summary for Run 88 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
88 (HELP-10C-R1S+R1VGs)	-4.01	58.60	0.2002	1.396	1.97	0.81	0.0249	0.1631	0.7798	-0.3600	0.1494
	0.03	58.46	0.2000	1.394	1.99	0.82	0.0253	0.1674	1.2199	-0.3771	0.1596
	2.01	58.31	0.1997	1.393	1.95	0.80	0.0244	0.1603	1.3692	-0.3580	0.1675
	4.01	58.37	0.1998	1.394	1.97	0.80	0.0245	0.1624	1.5287	-0.3383	0.1788
	6.00	58.40	0.1999	1.394	1.97	0.80	0.0247	0.1630	1.6723	-0.3104	0.1919
	7.00	58.34	0.1997	1.392	1.95	0.80	0.0247	0.1607	1.7475	-0.2960	0.2014
	8.01	58.71	0.2004	1.397	1.97	0.80	0.0244	0.1611	1.8265	-0.2828	0.2112
	9.02	58.25	0.1996	1.391	1.96	0.80	0.0248	0.1623	1.8915	-0.2629	0.2199
	9.98	58.11	0.1993	1.390	1.96	0.78	0.0235	0.1592	1.9559	-0.2468	0.2287
	11.01	58.27	0.1996	1.392	1.99	0.81	0.0249	0.1668	2.0235	-0.2314	0.2381
	12.01	58.39	0.1998	1.393	1.96	0.80	0.0246	0.1611	2.0680	-0.2086	0.2453
	13.00	58.61	0.2002	1.396	1.92	0.79	0.0246	0.1564	2.1125	-0.1866	0.2532
	14.01	58.44	0.1999	1.394	1.93	0.80	0.0246	0.1583	2.1716	-0.1701	0.2641
	15.01	58.34	0.1997	1.393	1.95	0.80	0.0247	0.1612	2.2212	-0.1565	0.2750
	15.49	58.42	0.1999	1.392	1.94	0.79	0.0243	0.1577	2.2397	-0.1451	0.2786
	16.02	58.44	0.1999	1.393	1.94	0.80	0.0246	0.1593	2.2756	-0.1337	0.2844
	16.49	58.25	0.1996	1.391	1.96	0.79	0.0243	0.1603	2.2815	-0.1282	0.3005
	17.00	58.68	0.2003	1.396	1.95	0.78	0.0235	0.1554	2.2905	-0.1209	0.3052
	17.52	58.59	0.2002	1.393	1.91	0.79	0.0244	0.1545	2.2875	-0.1086	0.3088
	17.99	58.65	0.2003	1.395	1.96	0.80	0.0245	0.1595	2.2817	-0.1095	0.3141
	18.50	58.70	0.2004	1.396	1.94	0.79	0.0242	0.1564	2.2293	-0.1248	0.3252
	19.00	58.61	0.2002	1.394	1.92	0.77	0.0234	0.1516	2.2208	-0.1297	0.3433

Table C31. Aerodynamic Data Summary for Run 89 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
89 (HELP-10C +R1VGs)	-4.01	58.67	0.2003	1.407	1.53	0.78	0.0176	0.1221	0.7393	-0.3430	0.1490
	0.03	58.57	0.2001	1.405	1.54	0.79	0.0179	0.1247	1.1929	-0.3635	0.1583
	1.99	58.41	0.1998	1.402	1.54	0.79	0.0178	0.1245	1.3564	-0.3465	0.1670
	4.01	58.49	0.2000	1.405	1.55	0.79	0.0179	0.1255	1.5180	-0.3272	0.1789
	6.02	58.16	0.1994	1.400	1.55	0.79	0.0180	0.1266	1.6727	-0.3035	0.1922
	7.00	58.49	0.2000	1.404	1.55	0.80	0.0181	0.1265	1.7549	-0.2930	0.2025
	8.01	58.29	0.1996	1.400	1.55	0.80	0.0183	0.1273	1.8343	-0.2800	0.2118
	9.00	58.34	0.1997	1.401	1.55	0.81	0.0189	0.1290	1.9037	-0.2655	0.2206
	10.00	58.49	0.2000	1.403	1.56	0.79	0.0180	0.1267	1.9770	-0.2519	0.2301
	11.01	58.39	0.1998	1.401	1.54	0.78	0.0176	0.1239	2.0443	-0.2370	0.2397
	12.01	58.54	0.2001	1.403	1.54	0.79	0.0179	0.1243	2.1090	-0.2233	0.2493
	13.00	58.71	0.2004	1.404	1.55	0.78	0.0175	0.1236	2.1707	-0.2081	0.2579
	14.01	58.47	0.1999	1.402	1.54	0.79	0.0179	0.1245	2.2290	-0.1918	0.2676
	15.01	58.72	0.2004	1.405	1.54	0.78	0.0176	0.1229	2.2729	-0.1766	0.2771
	15.49	58.55	0.2001	1.402	1.54	0.78	0.0177	0.1234	2.2960	-0.1674	0.2807
	16.02	58.21	0.1995	1.398	1.54	0.78	0.0178	0.1246	2.3310	-0.1555	0.2869
	16.98	58.39	0.1998	1.400	1.54	0.79	0.0180	0.1250	2.3311	-0.1438	0.3065
	17.50	58.68	0.2003	1.402	1.54	0.78	0.0175	0.1226	2.3267	-0.1356	0.3092
	18.01	58.45	0.1999	1.399	1.55	0.79	0.0178	0.1248	2.3005	-0.1374	0.3159
	18.48	58.44	0.1999	1.399	1.55	0.78	0.0176	0.1241	2.2455	-0.1683	0.3362
	19.02	58.45	0.1999	1.399	1.54	0.78	0.0177	0.1239	2.2398	-0.1755	0.3562

Table C32. Aerodynamic Data Summary for Run 90 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
90 (AFC-off, M_∞ = 0.125)	-3.99	23.28	0.1251	0.911	1.0	0	0	0	0.2856	-0.2043	0.1408
	0.03	23.15	0.1247	0.908	1.0	0	0	0	0.7870	-0.2161	0.1403
	2.01	23.18	0.1248	0.908	1.0	0	0	0	0.9625	-0.2065	0.1431
	4.01	23.11	0.1246	0.907	1.0	0	0	0	1.1274	-0.1889	0.1515
	6.02	23.24	0.1250	0.909	1.0	0	0	0	1.2817	-0.1685	0.1599
	7.00	23.18	0.1248	0.908	1.0	0	0	0	1.3587	-0.1569	0.1659
	7.99	23.30	0.1251	0.910	1.0	0	0	0	1.4401	-0.1463	0.1727
	9.00	23.24	0.1250	0.909	1.0	0	0	0	1.5220	-0.1346	0.1820
	10.00	23.21	0.1249	0.908	1.0	0	0	0	1.5993	-0.1238	0.1916
	10.99	23.21	0.1249	0.908	1.0	0	0	0	1.6679	-0.1105	0.1998
	11.99	23.20	0.1249	0.908	1.0	0	0	0	1.7341	-0.0953	0.2091
	13.00	23.25	0.1250	0.908	1.0	0	0	0	1.8036	-0.0807	0.2196
	14.01	23.15	0.1247	0.907	1.0	0	0	0	1.8643	-0.0661	0.2294
	15.01	23.25	0.1250	0.908	1.0	0	0	0	1.9234	-0.0486	0.2398
	15.48	23.21	0.1249	0.907	1.0	0	0	0	1.9534	-0.0424	0.2550
	16.00	23.23	0.1250	0.908	1.0	0	0	0	1.9812	-0.0336	0.2615
	16.49	23.24	0.1250	0.907	1.0	0	0	0	2.0138	-0.0241	0.2693
	16.98	23.20	0.1249	0.907	1.0	0	0	0	2.0389	-0.0150	0.2770
	17.50	23.16	0.1248	0.906	1.0	0	0	0	2.0617	-0.0065	0.2847
	17.97	23.17	0.1248	0.906	1.0	0	0	0	2.0725	0.0018	0.2906
	18.48	23.20	0.1249	0.907	1.0	0	0	0	2.0785	0.0080	0.2978
	19.00	23.24	0.1250	0.907	1.0	0	0	0	2.0763	0.0109	0.3060

Table C33. Aerodynamic Data Summary for Run 91 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
91 (HELP-10C, M_∞ = 0.125)	-3.99	23.33	0.1252	0.908	1.11	0.40	0.0128	0.1832	0.6202	-0.3128	0.1458
	0.03	23.13	0.1247	0.904	1.11	0.40	0.0128	0.1853	1.0914	-0.3462	0.1506
	2.01	23.20	0.1249	0.905	1.11	0.40	0.0128	0.1843	1.2628	-0.3297	0.1599
	4.01	23.13	0.1247	0.904	1.11	0.40	0.0128	0.1856	1.4292	-0.3126	0.1718
	6.02	23.24	0.1250	0.906	1.11	0.41	0.0130	0.1866	1.5830	-0.2904	0.1853
	7.00	23.31	0.1252	0.908	1.11	0.41	0.0128	0.1847	1.6591	-0.2794	0.1936
	8.01	23.26	0.1250	0.907	1.11	0.41	0.0128	0.1849	1.7406	-0.2674	0.2026
	9.00	23.27	0.1251	0.907	1.11	0.41	0.0130	0.1865	1.8101	-0.2524	0.2110
	10.00	23.15	0.1247	0.905	1.11	0.41	0.0131	0.1884	1.8809	-0.2375	0.2195
	11.01	23.42	0.1255	0.909	1.12	0.41	0.0131	0.1866	1.9461	-0.2222	0.2286
	12.01	23.19	0.1248	0.905	1.12	0.41	0.0132	0.1902	2.0127	-0.2065	0.2385
	12.98	23.27	0.1251	0.907	1.12	0.41	0.0133	0.1904	2.0724	-0.1886	0.2468
	14.01	23.27	0.1251	0.907	1.12	0.42	0.0135	0.1920	2.1390	-0.1689	0.2581
	15.01	23.22	0.1249	0.906	1.12	0.42	0.0137	0.1940	2.1815	-0.1505	0.2782
	15.49	23.23	0.1249	0.906	1.12	0.42	0.0138	0.1948	2.2042	-0.1414	0.2832
	16.02	23.20	0.1249	0.905	1.13	0.42	0.0138	0.1954	2.2296	-0.1324	0.2903
	16.49	23.23	0.1250	0.906	1.13	0.42	0.0136	0.1942	2.2492	-0.1216	0.2952
	16.98	23.23	0.1250	0.905	1.13	0.42	0.0137	0.1945	2.2581	-0.1118	0.2995
	17.50	23.25	0.1250	0.906	1.13	0.42	0.0137	0.1945	2.2618	-0.1021	0.3046
	18.01	23.24	0.1250	0.906	1.13	0.42	0.0138	0.1954	2.2532	-0.0944	0.3087
	18.48	23.34	0.1253	0.908	1.13	0.42	0.0136	0.1930	2.2208	-0.1010	0.3147
	19.00	23.32	0.1252	0.908	1.12	0.40	0.0125	0.1832	2.1702	-0.1169	0.3355

Table C34. Aerodynamic Data Summary for Run 92 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
92 (HELP-10C, M_∞ = 0.125)	-3.99	23.36	0.1253	0.908	1.49	0.76	0.0412	0.4592	1.0697	-0.4391	0.1607
	0.03	23.12	0.1246	0.903	1.47	0.75	0.0410	0.4566	1.4473	-0.4246	0.1784
	2.01	23.33	0.1252	0.907	1.48	0.75	0.0404	0.4514	1.6062	-0.4093	0.1896
	4.01	23.09	0.1246	0.902	1.48	0.76	0.0416	0.4661	1.7752	-0.3922	0.2051
	6.02	23.18	0.1248	0.904	1.47	0.75	0.0409	0.4552	1.9213	-0.3668	0.2225
	7.00	23.18	0.1248	0.904	1.48	0.75	0.0414	0.4616	2.0030	-0.3558	0.2337
	8.01	23.25	0.1250	0.906	1.47	0.75	0.0411	0.4535	2.0716	-0.3422	0.2427
	9.00	23.18	0.1248	0.904	1.48	0.75	0.0414	0.4608	2.1517	-0.3351	0.2535
	10.00	23.14	0.1247	0.903	1.48	0.76	0.0418	0.4640	2.2237	-0.3197	0.2643
	11.01	23.28	0.1251	0.906	1.48	0.75	0.0412	0.4581	2.2919	-0.3070	0.2744
	12.01	23.20	0.1249	0.904	1.48	0.75	0.0410	0.4569	2.3495	-0.2919	0.2843
	12.98	23.19	0.1248	0.904	1.47	0.75	0.0405	0.4534	2.3938	-0.2770	0.2917
	14.01	23.24	0.1250	0.905	1.48	0.75	0.0412	0.4571	2.4475	-0.2611	0.3026
	15.01	23.23	0.1249	0.905	1.48	0.75	0.0411	0.4575	2.4994	-0.2453	0.3248
	15.49	23.23	0.1250	0.905	1.49	0.76	0.0415	0.4634	2.5257	-0.2376	0.3316
	16.00	23.20	0.1249	0.904	1.47	0.75	0.0408	0.4552	2.5236	-0.2265	0.3338
	16.49	23.20	0.1249	0.904	1.47	0.74	0.0403	0.4520	2.5156	-0.2198	0.3363
	17.00	23.32	0.1252	0.907	1.48	0.74	0.0396	0.4480	2.5089	-0.2106	0.3392
	17.52	23.19	0.1248	0.904	1.49	0.76	0.0421	0.4674	2.4978	-0.2056	0.3420
	17.99	23.19	0.1248	0.904	1.48	0.75	0.0409	0.4577	2.4556	-0.2059	0.3470
	18.50	23.19	0.1248	0.904	1.48	0.75	0.0412	0.4607	2.3948	-0.2283	0.3650
	19.00	23.25	0.1250	0.905	1.48	0.75	0.0406	0.4539	2.3872	-0.2238	0.3785

Table C35. Aerodynamic Data Summary for Run 93 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
93 (AFC-off, M_∞ = 0.15)	-3.99	33.36	0.1501	1.081	1.0	0	0	0	0.2873	-0.2022	0.1411
	0.05	33.26	0.1498	1.079	1.0	0	0	0	0.7968	-0.2202	0.1385
	2.02	33.25	0.1498	1.079	1.0	0	0	0	0.9674	-0.2071	0.1412
	4.01	33.27	0.1499	1.079	1.0	0	0	0	1.1302	-0.1881	0.1472
	6.02	33.30	0.1499	1.079	1.0	0	0	0	1.2868	-0.1681	0.1580
	7.00	33.35	0.1501	1.080	1.0	0	0	0	1.3630	-0.1563	0.1638
	7.99	33.06	0.1494	1.076	1.0	0	0	0	1.4393	-0.1450	0.1707
	9.00	33.21	0.1497	1.078	1.0	0	0	0	1.5235	-0.1350	0.1791
	10.00	33.48	0.1503	1.082	1.0	0	0	0	1.5989	-0.1244	0.1882
	10.99	33.19	0.1497	1.078	1.0	0	0	0	1.6735	-0.1109	0.1970
	12.01	33.30	0.1499	1.079	1.0	0	0	0	1.7390	-0.0957	0.2062
	13.00	33.34	0.1500	1.080	1.0	0	0	0	1.8064	-0.0816	0.2161
	14.01	33.25	0.1498	1.078	1.0	0	0	0	1.8691	-0.0671	0.2262
	15.01	33.24	0.1498	1.078	1.0	0	0	0	1.9301	-0.0523	0.2369
	15.48	33.37	0.1501	1.080	1.0	0	0	0	1.9598	-0.0450	0.2424
	16.00	33.33	0.1500	1.079	1.0	0	0	0	1.9862	-0.0360	0.2481
	16.49	33.33	0.1500	1.079	1.0	0	0	0	2.0223	-0.0264	0.2667
	17.02	33.34	0.1500	1.079	1.0	0	0	0	2.0512	-0.0187	0.2742
	17.48	33.30	0.1499	1.078	1.0	0	0	0	2.0739	-0.0090	0.2816
	17.99	33.15	0.1496	1.076	1.0	0	0	0	2.0851	-0.0017	0.2877
	18.48	33.35	0.1501	1.079	1.0	0	0	0	2.0893	0.0028	0.2943
	19.02	33.33	0.1500	1.078	1.0	0	0	0	2.0821	0.0010	0.3043

Table C36. Aerodynamic Data Summary for Run 94 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
94 (HELP-10C, M_∞ = 0.15)	-3.99	33.59	0.1506	1.081	1.52	0.79	0.0314	0.2852	0.9286	-0.3985	0.1558
	0.03	33.22	0.1497	1.075	1.53	0.80	0.0319	0.2922	1.3454	-0.4003	0.1699
	2.01	33.28	0.1499	1.076	1.53	0.79	0.0313	0.2895	1.5083	-0.3845	0.1808
	3.99	33.32	0.1500	1.077	1.52	0.78	0.0309	0.2848	1.6579	-0.3645	0.1930
	6.02	33.31	0.1500	1.076	1.52	0.79	0.0315	0.2886	1.8140	-0.3408	0.2090
	7.00	33.20	0.1497	1.075	1.53	0.79	0.0315	0.2907	1.8987	-0.3307	0.2201
	8.01	33.28	0.1499	1.076	1.53	0.79	0.0313	0.2888	1.9764	-0.3183	0.2302
	9.00	33.38	0.1501	1.077	1.52	0.79	0.0312	0.2859	2.0463	-0.3054	0.2392
	10.00	33.33	0.1500	1.076	1.54	0.79	0.0317	0.2931	2.1282	-0.2951	0.2504
	11.01	33.30	0.1499	1.076	1.54	0.80	0.0319	0.2940	2.1973	-0.2819	0.2606
	12.01	33.43	0.1502	1.078	1.54	0.79	0.0316	0.2911	2.2648	-0.2683	0.2709
	13.00	33.50	0.1504	1.079	1.55	0.80	0.0317	0.2923	2.3215	-0.2542	0.2799
	14.01	33.17	0.1496	1.073	1.54	0.80	0.0320	0.2958	2.3786	-0.2398	0.2909
	15.01	33.37	0.1501	1.077	1.54	0.80	0.0319	0.2927	2.4292	-0.2222	0.3017
	15.48	33.37	0.1501	1.077	1.54	0.79	0.0317	0.2926	2.4438	-0.2142	0.3170
	16.00	33.36	0.1501	1.076	1.54	0.79	0.0314	0.2907	2.4596	-0.2063	0.3224
	16.51	33.35	0.1500	1.076	1.54	0.80	0.0318	0.2936	2.4608	-0.1981	0.3262
	17.00	33.36	0.1501	1.076	1.55	0.80	0.0320	0.2944	2.4548	-0.1906	0.3283
	17.52	33.30	0.1499	1.075	1.55	0.80	0.0321	0.2964	2.4492	-0.1836	0.3322
	17.99	33.36	0.1501	1.076	1.53	0.79	0.0314	0.2891	2.3963	-0.1862	0.3359
	18.50	33.25	0.1498	1.075	1.53	0.78	0.0311	0.2879	2.3353	-0.2230	0.3612
	19.00	33.26	0.1498	1.075	1.53	0.79	0.0313	0.2892	2.3417	-0.2147	0.3720

Table C37. Aerodynamic Data Summary for Run 95 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
95 (HELP-10C, M_∞ = 0.175)	-3.99	45.18	0.1752	1.248	1.53	0.79	0.0234	0.1832	0.8189	-0.3673	0.1519
	0.03	44.92	0.1746	1.244	1.54	0.79	0.0235	0.1850	1.2520	-0.3792	0.1628
	2.01	44.98	0.1748	1.245	1.55	0.79	0.0233	0.1853	1.4201	-0.3628	0.1728
	4.01	45.23	0.1753	1.248	1.54	0.79	0.0236	0.1841	1.5765	-0.3439	0.1839
	6.00	45.14	0.1751	1.247	1.55	0.79	0.0236	0.1857	1.7322	-0.3213	0.1991
	7.00	45.01	0.1748	1.244	1.55	0.79	0.0232	0.1846	1.8171	-0.3097	0.2099
	8.01	45.09	0.1750	1.246	1.54	0.79	0.0233	0.1841	1.8944	-0.2964	0.2196
	9.02	45.06	0.1749	1.245	1.54	0.79	0.0233	0.1845	1.9679	-0.2836	0.2290
	10.00	45.24	0.1753	1.247	1.55	0.79	0.0233	0.1851	2.0407	-0.2711	0.2382
	11.01	45.19	0.1752	1.246	1.55	0.79	0.0232	0.1842	2.1114	-0.2576	0.2484
	12.01	45.17	0.1752	1.246	1.55	0.80	0.0237	0.1869	2.1759	-0.2441	0.2582
	13.00	44.93	0.1747	1.242	1.55	0.79	0.0236	0.1875	2.2432	-0.2306	0.2680
	13.99	45.31	0.1754	1.247	1.54	0.79	0.0234	0.1841	2.2954	-0.2136	0.2771
	15.01	45.05	0.1749	1.243	1.55	0.79	0.0231	0.1844	2.3490	-0.1997	0.2877
	15.49	45.12	0.1751	1.245	1.56	0.80	0.0237	0.1879	2.3868	-0.1920	0.2940
	16.02	45.11	0.1750	1.244	1.55	0.79	0.0234	0.1861	2.3862	-0.1820	0.3097
	16.49	45.08	0.1750	1.243	1.55	0.80	0.0237	0.1876	2.3939	-0.1756	0.3141
	17.02	45.00	0.1748	1.242	1.55	0.79	0.0236	0.1874	2.3965	-0.1661	0.3177
	17.50	45.03	0.1749	1.243	1.56	0.80	0.0236	0.1883	2.3906	-0.1600	0.3203
	18.01	45.09	0.1750	1.243	1.55	0.80	0.0236	0.1875	2.3486	-0.1624	0.3252
	18.48	45.10	0.1750	1.244	1.56	0.80	0.0238	0.1896	2.2994	-0.1955	0.3457
	19.02	45.19	0.1752	1.245	1.56	0.80	0.0236	0.1881	2.2870	-0.1996	0.3656

Table C38. Aerodynamic Data Summary for Run 96 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
96 (AFC-off, M_∞ = 0.175)	-3.99	44.86	0.1751	1.267	1.0	0	0	0	0.2669	-0.1852	0.1411
	0.03	44.74	0.1749	1.264	1.0	0	0	0	0.7925	-0.2242	0.1369
	2.01	44.72	0.1748	1.262	1.0	0	0	0	0.9619	-0.2092	0.1397
	4.01	44.77	0.1749	1.263	1.0	0	0	0	1.1290	-0.1914	0.1473
	6.02	44.68	0.1747	1.261	1.0	0	0	0	1.2830	-0.1695	0.1563
	7.00	44.65	0.1747	1.260	1.0	0	0	0	1.3607	-0.1589	0.1627
	8.01	44.73	0.1748	1.260	1.0	0	0	0	1.4390	-0.1465	0.1693
	9.00	44.80	0.1750	1.261	1.0	0	0	0	1.5205	-0.1371	0.1780
	10.00	44.73	0.1748	1.260	1.0	0	0	0	1.5978	-0.1250	0.1865
	11.01	44.95	0.1753	1.262	1.0	0	0	0	1.6706	-0.1127	0.1961
	12.01	44.92	0.1752	1.261	1.0	0	0	0	1.7414	-0.0982	0.2052
	12.98	44.77	0.1749	1.258	1.0	0	0	0	1.8052	-0.0840	0.2138
	14.01	44.96	0.1753	1.260	1.0	0	0	0	1.8673	-0.0698	0.2248
	15.01	44.51	0.1744	1.254	1.0	0	0	0	1.9305	-0.0560	0.2361
	15.49	44.86	0.1751	1.258	1.0	0	0	0	1.9602	-0.0472	0.2410
	16.02	44.88	0.1751	1.258	1.0	0	0	0	1.9889	-0.0387	0.2473
	16.49	44.57	0.1745	1.253	1.0	0	0	0	2.0172	-0.0297	0.2525
	17.00	44.69	0.1748	1.255	1.0	0	0	0	2.0518	-0.0226	0.2724
	17.48	44.55	0.1745	1.252	1.0	0	0	0	2.0762	-0.0144	0.2799
	18.01	44.90	0.1752	1.257	1.0	0	0	0	2.0857	-0.0069	0.2868
	18.48	44.80	0.1750	1.255	1.0	0	0	0	2.0922	-0.0023	0.2932
	18.98	44.70	0.1748	1.253	1.0	0	0	0	2.0826	-0.0082	0.3023

Table C39. Aerodynamic Data Summary for Run 97 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
97 (HELP-10C, M_∞ = 0.175)	-3.99	45.00	0.1755	1.248	1.27	0.60	0.0138	0.1146	0.6594	-0.3282	0.1457
	0.03	44.68	0.1748	1.243	1.27	0.60	0.0139	0.1154	1.1232	-0.3553	0.1519
	2.01	44.27	0.1740	1.237	1.27	0.60	0.0140	0.1173	1.2956	-0.3381	0.1620
	4.01	44.59	0.1746	1.242	1.26	0.59	0.0137	0.1143	1.4563	-0.3195	0.1723
	6.02	44.55	0.1746	1.241	1.25	0.58	0.0130	0.1104	1.6035	-0.2925	0.1852
	7.00	44.62	0.1747	1.242	1.24	0.57	0.0128	0.1088	1.6759	-0.2798	0.1930
	8.01	44.77	0.1750	1.244	1.24	0.57	0.0128	0.1085	1.7534	-0.2679	0.2023
	9.00	44.90	0.1753	1.246	1.24	0.57	0.0127	0.1079	1.8253	-0.2520	0.2109
	10.00	44.70	0.1749	1.242	1.25	0.57	0.0128	0.1086	1.8940	-0.2390	0.2194
	11.01	44.69	0.1748	1.242	1.25	0.57	0.0127	0.1084	1.9605	-0.2227	0.2283
	12.01	44.91	0.1753	1.245	1.25	0.57	0.0127	0.1081	2.0210	-0.2058	0.2370
	13.00	44.83	0.1751	1.244	1.25	0.57	0.0126	0.1078	2.0841	-0.1871	0.2466
	14.01	44.70	0.1749	1.242	1.25	0.57	0.0127	0.1088	2.1486	-0.1687	0.2572
	15.01	44.90	0.1753	1.245	1.26	0.57	0.0128	0.1089	2.2005	-0.1519	0.2677
	15.49	44.71	0.1749	1.242	1.26	0.58	0.0131	0.1114	2.2327	-0.1444	0.2730
	16.00	44.64	0.1747	1.241	1.27	0.58	0.0133	0.1132	2.2633	-0.1354	0.2784
	16.49	44.66	0.1748	1.241	1.27	0.58	0.0134	0.1138	2.2742	-0.1283	0.2956
	17.02	44.59	0.1746	1.239	1.28	0.59	0.0137	0.1157	2.2860	-0.1211	0.3006
	17.50	44.96	0.1754	1.243	1.28	0.59	0.0136	0.1142	2.2843	-0.1124	0.3042
	17.99	44.83	0.1751	1.242	1.28	0.59	0.0137	0.1153	2.2685	-0.1085	0.3076
	18.48	44.85	0.1752	1.242	1.28	0.58	0.0133	0.1135	2.2081	-0.1422	0.3286
	19.02	44.90	0.1753	1.243	1.28	0.59	0.0136	0.1144	2.2014	-0.1493	0.3476

Table C40. Aerodynamic Data Summary for Run 98 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
98 (HELP-10C)	-3.99	58.26	0.2003	1.406	1.12	0.43	0.0059	0.0496	0.4490	-0.2612	0.1335
	0.03	57.99	0.1998	1.401	1.12	0.43	0.0059	0.0499	0.9213	-0.2876	0.1297
	2.01	58.08	0.2000	1.402	1.12	0.43	0.0059	0.0495	1.1029	-0.2735	0.1387
	4.01	57.87	0.1996	1.400	1.12	0.43	0.0059	0.0498	1.2720	-0.2522	0.1496
	6.02	57.86	0.1996	1.401	1.12	0.42	0.0057	0.0488	1.4171	-0.2231	0.1603
	7.00	58.04	0.1999	1.402	1.11	0.41	0.0053	0.0467	1.4822	-0.2080	0.1657
	8.01	57.72	0.1993	1.398	1.11	0.41	0.0055	0.0476	1.5647	-0.1974	0.1746
	9.00	58.01	0.1999	1.401	1.11	0.41	0.0054	0.0473	1.6412	-0.1841	0.1831
	10.00	57.86	0.1996	1.399	1.12	0.41	0.0054	0.0475	1.7126	-0.1688	0.1922
	11.01	58.16	0.2001	1.402	1.12	0.41	0.0053	0.0469	1.7857	-0.1518	0.2025
	12.01	58.06	0.1999	1.401	1.12	0.41	0.0054	0.0475	1.8548	-0.1377	0.2125
	13.00	58.11	0.2000	1.401	1.13	0.42	0.0056	0.0487	1.9258	-0.1235	0.2235
	14.01	57.86	0.1996	1.398	1.13	0.43	0.0058	0.0500	1.9935	-0.1086	0.2341
	15.01	58.04	0.1999	1.400	1.14	0.43	0.0060	0.0509	2.0531	-0.0940	0.2455
	15.49	58.22	0.2002	1.402	1.14	0.44	0.0060	0.0509	2.0796	-0.0866	0.2502
	16.00	58.19	0.2002	1.401	1.14	0.43	0.0060	0.0509	2.1098	-0.0768	0.2558
	16.49	57.96	0.1998	1.399	1.14	0.44	0.0061	0.0514	2.1382	-0.0663	0.2615
	17.02	57.94	0.1998	1.397	1.13	0.43	0.0059	0.0505	2.1526	-0.0579	0.2796
	17.50	58.13	0.2001	1.399	1.12	0.41	0.0054	0.0476	2.1563	-0.0473	0.2842
	18.01	58.25	0.2003	1.401	1.12	0.41	0.0054	0.0474	2.1602	-0.0429	0.2905
	18.48	58.15	0.2002	1.399	1.12	0.41	0.0054	0.0477	2.1288	-0.0507	0.2974
	19.02	58.01	0.1999	1.397	1.12	0.41	0.0054	0.0476	2.1031	-0.0854	0.3276

Table C41. Aerodynamic Data Summary for Run 101 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
	-3.99	58.05	0.2002	1.411	1.92	1.05	0.0318	0.2069	0.8769	-0.3828	0.1536
	0.01	57.84	0.1998	1.401	2.09	1.16	0.0354	0.2504	1.3303	-0.4018	0.1690
	2.01	57.83	0.1998	1.401	2.08	1.16	0.0354	0.2505	1.4918	-0.3859	0.1796
	4.01	57.90	0.1999	1.395	2.07	1.15	0.0347	0.2460	1.6527	-0.3660	0.1918
	6.00	57.51	0.1992	1.390	2.08	1.16	0.0356	0.2531	1.8075	-0.3445	0.2086
	7.02	57.93	0.2000	1.394	2.01	1.16	0.0365	0.2407	1.8750	-0.3291	0.2171
	8.01	57.87	0.1999	1.388	1.94	1.08	0.0326	0.2166	1.9398	-0.3125	0.2256
	9.02	57.77	0.1997	1.386	1.94	1.08	0.0328	0.2180	2.0147	-0.3009	0.2364
	10.00	57.61	0.1994	1.384	1.94	1.08	0.0330	0.2190	2.0872	-0.2897	0.2455
101	11.01	58.02	0.2002	1.389	1.93	1.07	0.0320	0.2123	2.1523	-0.2748	0.2550
	12.02	58.13	0.2004	1.387	2.01	1.11	0.0333	0.2302	2.2403	-0.2664	0.2683
(HELP-10C^)	13.00	57.83	0.1998	1.383	2.04	1.13	0.0341	0.2394	2.3084	-0.2560	0.2786
	13.99	57.99	0.2001	1.384	2.06	1.14	0.0347	0.2440	2.3653	-0.2430	0.2888
	15.01	58.04	0.2002	1.385	2.10	1.16	0.0350	0.2519	2.4365	-0.2282	0.3013
	15.49	57.83	0.1998	1.382	2.03	1.16	0.0362	0.2446	2.4469	-0.2154	0.3035
	16.02	57.76	0.1997	1.380	2.10	1.16	0.0353	0.2539	2.4493	-0.2139	0.3194
	16.51	58.10	0.2003	1.383	1.92	1.01	0.0289	0.2015	2.4200	-0.1943	0.3180
	17.00	57.94	0.2000	1.381	1.96	1.08	0.0324	0.2200	2.4238	-0.1896	0.3221
	17.50	58.03	0.2002	1.382	1.95	1.09	0.0331	0.2195	2.4100	-0.1822	0.3236
	17.99	57.89	0.1999	1.379	1.94	1.07	0.0323	0.2159	2.3567	-0.1890	0.3303
	18.52	57.82	0.1998	1.378	1.94	1.07	0.0323	0.2166	2.3116	-0.2186	0.3542
	19.00	58.01	0.2001	1.380	2.00	1.10	0.0327	0.2275	2.3174	-0.2233	0.3709

Table C42. Aerodynamic Data Summary for Run 102 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
	-3.99	57.88	0.1999	1.369	1.50	0.644	0.0128	0.1007	0.7301	-0.3431	0.1498
	0.03	58.13	0.2004	1.368	1.59	0.707	0.0152	0.1165	1.1994	-0.3712	0.1596
	0.03	57.92	0.2000	1.364	1.59	0.706	0.0152	0.1170	1.1996	-0.3720	0.1593
	2.01	58.06	0.2002	1.364	1.53	0.665	0.0136	0.1057	1.3483	-0.3512	0.1693
	4.03	57.90	0.1999	1.359	1.61	0.714	0.0155	0.1201	1.5360	-0.3397	0.1842
	6.02	57.75	0.1997	1.357	1.62	0.719	0.0157	0.1219	1.6876	-0.3180	0.1977
	7.00	57.92	0.2000	1.359	1.49	0.721	0.0161	0.1123	1.7347	-0.2991	0.2026
	7.00	57.77	0.1997	1.357	1.44	0.618	0.0120	0.0936	1.7198	-0.2963	0.2009
	8.01	57.95	0.2000	1.358	1.66	0.74	0.0164	0.1283	1.8635	-0.2979	0.2184
	9.02	58.18	0.2005	1.356	1.55	0.701	0.0150	0.1129	1.9037	-0.2762	0.2211
102	10.02	57.91	0.2000	1.352	1.57	0.715	0.0156	0.1173	1.9817	-0.2643	0.2345
	11.01	57.79	0.1998	1.350	1.46	0.647	0.0131	0.0993	2.0141	-0.2408	0.2382
(HELP-10C^)	12.01	58.19	0.2005	1.354	1.46	0.664	0.0138	0.1011	2.0812	-0.2264	0.2463
	13.00	58.07	0.2003	1.352	1.47	0.653	0.0133	0.0999	2.1433	-0.2124	0.2564
	14.01	57.87	0.1999	1.350	1.48	0.653	0.0133	0.1014	2.2083	-0.1972	0.2663
	15.01	58.09	0.2003	1.352	1.57	0.716	0.0157	0.1174	2.2883	-0.1912	0.2802
	15.49	58.11	0.2004	1.352	1.47	0.652	0.0133	0.1000	2.2834	-0.1702	0.2795
	16.02	57.92	0.2000	1.349	1.47	0.655	0.0134	0.1009	2.2910	-0.1619	0.2949
	16.49	57.86	0.1999	1.346	1.58	0.714	0.0157	0.1183	2.3371	-0.1663	0.3044
	17.00	57.88	0.1999	1.347	1.58	0.717	0.0158	0.1187	2.3416	-0.1587	0.3083
	17.50	58.02	0.2002	1.348	1.47	0.655	0.0134	0.1009	2.3064	-0.1376	0.3072
	18.01	57.88	0.1999	1.347	1.48	0.656	0.0134	0.1016	2.2772	-0.1359	0.3126
	18.50	57.79	0.1998	1.345	1.48	0.658	0.0135	0.1023	2.2213	-0.1715	0.3341
	19.00	57.97	0.2001	1.347	1.58	0.719	0.0158	0.1193	2.2375	-0.1871	0.3546

Table C43. Aerodynamic Data Summary for Run 103 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
103 (HELP-10C^)	-3.99	57.92	0.2001	1.338	2.32	1.30	0.0399	0.3152	0.9807	-0.4189	0.1533
	-0.01	58.04	0.2003	1.339	2.27	1.27	0.0392	0.3012	1.3638	-0.4146	0.1692
	2.01	57.67	0.1996	1.334	2.27	1.26	0.0390	0.3036	1.5316	-0.3991	0.1837
	4.01	57.84	0.1999	1.335	2.29	1.27	0.0391	0.3055	1.6934	-0.3809	0.1973
	6.00	57.67	0.1996	1.333	2.29	1.27	0.0394	0.3082	1.8481	-0.3597	0.2138
	7.00	57.83	0.1999	1.335	2.32	1.28	0.0391	0.3120	1.9364	-0.3515	0.2248
	8.01	57.78	0.1998	1.333	2.32	1.29	0.0395	0.3160	2.0170	-0.3398	0.2360
	9.00	57.84	0.2000	1.333	2.45	1.39	0.0429	0.3583	2.1197	-0.3387	0.2487
	10.00	57.66	0.1996	1.331	2.46	1.38	0.0428	0.3598	2.1972	-0.3277	0.2611
	11.01	57.96	0.2002	1.334	2.45	1.38	0.0426	0.3567	2.2653	-0.3138	0.2703
	12.01	57.89	0.2000	1.333	2.47	1.40	0.0434	0.3639	2.3360	-0.3004	0.2820
	13.00	57.46	0.1993	1.328	2.47	1.40	0.0434	0.3675	2.3944	-0.2881	0.2910
	14.01	57.91	0.2001	1.333	2.45	1.40	0.0435	0.3596	2.4391	-0.2732	0.2998
	15.01	58.11	0.2004	1.335	2.29	1.29	0.0395	0.3098	2.4760	-0.2451	0.3073
	15.49	58.11	0.2004	1.335	2.30	1.29	0.0395	0.3106	2.4933	-0.2376	0.3119
	16.02	57.86	0.2000	1.331	2.35	1.28	0.0382	0.3158	2.4957	-0.2350	0.3253

Table C44. Aerodynamic Data Summary for Run 104 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
104 (HELP-10C^)	0.01	57.54	0.1997	1.359	1.55	0.714	0.0156	0.1161	1.1839	-0.3715	0.1513
	4.01	57.62	0.1999	1.360	1.48	0.664	0.0137	0.1032	1.4958	-0.3337	0.1756
	8.01	57.42	0.1995	1.357	1.55	0.706	0.0154	0.1153	1.8293	-0.2924	0.2108
	12.02	57.78	0.2001	1.360	1.49	0.665	0.0137	0.1037	2.0884	-0.2333	0.2457
	16.02	57.71	0.2000	1.358	1.55	0.705	0.0153	0.1142	2.3327	-0.1733	0.2856

Table C45. Aerodynamic Data Summary for Run 106 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
106 (HELP-10C^)	-3.99	58.21	0.2003	1.457	1.46	0.677	0.0136	0.0996	0.7057	-0.3379	0.1453
	0.01	58.01	0.1999	1.453	1.46	0.677	0.0137	0.1004	1.1550	-0.3621	0.1531
	2.01	58.06	0.2000	1.451	1.52	0.719	0.0153	0.1113	1.3466	-0.3470	0.1645
	4.03	58.04	0.2000	1.450	1.46	0.67	0.0135	0.0994	1.4919	-0.3263	0.1747
	6.02	57.71	0.1994	1.445	1.46	0.665	0.0133	0.0995	1.6475	-0.3041	0.1889
	6.98	58.09	0.2001	1.448	1.52	0.71	0.0150	0.1099	1.7415	-0.2965	0.1993
	8.01	58.26	0.2004	1.450	1.46	0.667	0.0133	0.0989	1.8063	-0.2796	0.2072
	9.00	57.89	0.1997	1.444	1.47	0.668	0.0135	0.1001	1.8791	-0.2652	0.2163
	10.00	57.97	0.1999	1.443	1.51	0.699	0.0147	0.1081	1.9648	-0.2562	0.2269
	10.99	57.74	0.1994	1.439	1.45	0.649	0.0129	0.0968	2.0135	-0.2374	0.2335
	12.01	57.99	0.1999	1.442	1.46	0.651	0.0129	0.0969	2.0791	-0.2218	0.2437
	13.00	57.86	0.1997	1.439	1.51	0.692	0.0145	0.1072	2.1653	-0.2132	0.2556
	13.99	58.10	0.2001	1.440	1.45	0.642	0.0126	0.0950	2.2032	-0.1903	0.2620
	15.01	58.19	0.2002	1.441	1.46	0.642	0.0126	0.0950	2.2533	-0.1751	0.2729
	15.49	58.16	0.2002	1.439	1.51	0.684	0.0142	0.1051	2.2946	-0.1724	0.2795
	16.02	57.96	0.1998	1.437	1.46	0.641	0.0127	0.0956	2.3125	-0.1550	0.2831
	16.51	58.05	0.2000	1.437	1.46	0.643	0.0127	0.0959	2.3247	-0.1460	0.2869
	17.00	58.15	0.2002	1.436	1.51	0.676	0.0140	0.1041	2.3305	-0.1479	0.3044
	17.52	57.83	0.1996	1.431	1.45	0.632	0.0124	0.0942	2.3131	-0.1305	0.3058
	17.99	58.01	0.1999	1.432	1.46	0.634	0.0125	0.0944	2.2912	-0.1287	0.3095
	18.50	57.94	0.1998	1.431	1.51	0.675	0.0140	0.1047	2.2410	-0.1701	0.3328
	19.00	57.74	0.1995	1.427	1.45	0.632	0.0125	0.0946	2.2167	-0.1666	0.3472

Table C46. Aerodynamic Data Summary for Run 107 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
107 (HELP-10C^)	-3.99	58.17	0.2002	1.412	1.24	0.511	0.0084	0.0650	0.5792	-0.2995	0.1387
	0.01	58.16	0.2002	1.410	1.24	0.507	0.0083	0.0644	1.0386	-0.3257	0.1410
	2.01	57.84	0.1996	1.405	1.27	0.533	0.0091	0.0701	1.2435	-0.3184	0.1540
	4.01	58.04	0.2000	1.406	1.24	0.503	0.0082	0.0642	1.3833	-0.2903	0.1625
	6.02	57.93	0.1998	1.404	1.24	0.505	0.0083	0.0647	1.5415	-0.2694	0.1760
	7.00	57.93	0.1998	1.403	1.27	0.528	0.0090	0.0695	1.6359	-0.2669	0.1860
	7.99	58.02	0.1999	1.402	1.24	0.503	0.0082	0.0645	1.6972	-0.2474	0.1916
	9.00	58.13	0.2002	1.403	1.25	0.506	0.0083	0.0648	1.7709	-0.2336	0.2010
	10.00	58.16	0.2002	1.403	1.28	0.531	0.0091	0.0698	1.8643	-0.2277	0.2138
	11.01	57.92	0.1998	1.399	1.25	0.503	0.0082	0.0648	1.9075	-0.2019	0.2192
	11.99	57.85	0.1996	1.397	1.25	0.503	0.0082	0.0651	1.9720	-0.1862	0.2275
	13.00	58.04	0.2000	1.399	1.28	0.531	0.0091	0.0702	2.0540	-0.1786	0.2404
	13.99	58.08	0.2000	1.399	1.25	0.503	0.0082	0.0648	2.0941	-0.1505	0.2471
	15.01	58.11	0.2001	1.399	1.25	0.506	0.0083	0.0652	2.1476	-0.1331	0.2589
	15.49	58.10	0.2001	1.398	1.29	0.533	0.0091	0.0706	2.1916	-0.1334	0.2664
	16.02	57.88	0.1997	1.393	1.28	0.531	0.0091	0.0707	2.2292	-0.1214	0.2721
	16.51	58.02	0.1999	1.394	1.25	0.501	0.0081	0.0647	2.2121	-0.1033	0.2847
	17.00	57.92	0.1998	1.393	1.29	0.533	0.0091	0.0711	2.2469	-0.1063	0.2933
	17.52	58.13	0.2001	1.394	1.25	0.505	0.0082	0.0652	2.2323	-0.0892	0.2954
	17.99	58.09	0.2001	1.394	1.27	0.506	0.0082	0.0661	2.2308	-0.0873	0.3009
	18.48	58.08	0.2000	1.393	1.29	0.534	0.0091	0.0711	2.1848	-0.1235	0.3191
	19.02	57.88	0.1997	1.390	1.26	0.508	0.0083	0.0663	2.1558	-0.1281	0.3372

Table C47. Aerodynamic Data Summary for Run 108 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
	-3.99	58.15	0.2002	1.388	1.11	0.367	0.00447	0.0421	0.4360	-0.2487	0.1319
	-0.01	58.08	0.2001	1.385	1.11	0.367	0.00448	0.0422	0.9038	-0.2756	0.1268
	2.01	58.04	0.2000	1.384	1.11	0.366	0.00446	0.0421	1.0891	-0.2620	0.1356
	4.01	57.93	0.1998	1.382	1.11	0.366	0.00447	0.0423	1.2591	-0.2413	0.1469
	6.02	58.07	0.2000	1.384	1.11	0.367	0.00449	0.0424	1.4133	-0.2176	0.1590
	6.99	58.14	0.2002	1.384	1.12	0.367	0.00448	0.0423	1.4852	-0.2069	0.1651
	8.01	57.81	0.1996	1.379	1.12	0.367	0.00451	0.0428	1.5689	-0.1953	0.1740
	8.98	58.00	0.1999	1.381	1.12	0.368	0.00452	0.0427	1.6423	-0.1825	0.1825
	10.00	57.96	0.1998	1.380	1.12	0.366	0.00447	0.0426	1.7181	-0.1677	0.1925
108	11.01	58.02	0.1999	1.380	1.11	0.346	0.00401	0.0398	1.7736	-0.1452	0.2003
	11.99	58.07	0.2000	1.379	1.12	0.357	0.00426	0.0413	1.8492	-0.1341	0.2103
(HELP-10C^)	13.00	58.09	0.2001	1.378	1.13	0.378	0.00476	0.0443	1.9302	-0.1250	0.2226
	14.00	58.22	0.2003	1.380	1.11	0.353	0.00416	0.0406	1.9761	-0.0999	0.2309
	14.99	58.20	0.2003	1.379	1.12	0.354	0.00418	0.0409	2.0365	-0.0856	0.2425
	15.49	58.05	0.2000	1.377	1.13	0.378	0.00476	0.0444	2.0784	-0.0825	0.2494
	16.02	57.87	0.1997	1.374	1.12	0.355	0.00423	0.0414	2.0964	-0.0671	0.2534
	16.49	58.19	0.2002	1.377	1.13	0.378	0.00475	0.0443	2.1377	-0.0634	0.2609
	16.98	58.03	0.2000	1.375	1.12	0.356	0.00424	0.0414	2.1447	-0.0531	0.2773
	17.52	57.95	0.1998	1.374	1.12	0.357	0.00427	0.0416	2.1570	-0.0460	0.2840
	17.99	58.24	0.2003	1.377	1.14	0.378	0.00474	0.0444	2.1647	-0.0464	0.2894
	18.50	57.92	0.1998	1.372	1.12	0.355	0.00422	0.0414	2.1249	-0.0492	0.2972
	19.00	57.98	0.1999	1.372	1.14	0.38	0.00481	0.0449	2.1076	-0.0903	0.3265

Table C48. Aerodynamic Data Summary for Run 109 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
	-3.99	58.08	0.2001	1.367	2.50	1.39	0.0423	0.3610	1.0289	-0.4300	0.1538
	0.03	57.76	0.1995	1.362	2.52	1.41	0.0435	0.3723	1.4245	-0.4232	0.1705
	2.02	57.98	0.1999	1.365	2.40	1.33	0.0404	0.3325	1.5645	-0.4008	0.1816
	4.01	57.90	0.1998	1.363	2.53	1.42	0.0439	0.3756	1.7499	-0.3888	0.1974
	6.00	58.18	0.2003	1.366	2.41	1.33	0.0404	0.3341	1.8785	-0.3599	0.2124
	7.00	58.01	0.2000	1.364	2.53	1.42	0.0437	0.3747	1.9849	-0.3555	0.2260
	8.01	58.02	0.2000	1.364	2.41	1.33	0.0404	0.3345	2.0407	-0.3385	0.2345
	8.98	57.85	0.1997	1.362	2.42	1.34	0.0408	0.3392	2.1196	-0.3285	0.2457
	10.00	58.18	0.2002	1.365	2.54	1.42	0.0436	0.3759	2.2154	-0.3234	0.2587
109	11.01	58.19	0.2003	1.365	2.41	1.33	0.0403	0.3340	2.2627	-0.3023	0.2668
	11.99	57.73	0.1995	1.360	2.42	1.34	0.0410	0.3411	2.3345	-0.2905	0.2778
(HELP-10C^)	13.00	58.18	0.2003	1.364	2.54	1.44	0.0441	0.3793	2.4127	-0.2840	0.2903
	14.01	57.92	0.1998	1.361	2.42	1.35	0.0410	0.3405	2.4408	-0.2632	0.2979
	14.99	58.07	0.2001	1.363	2.43	1.35	0.0409	0.3408	2.5081	-0.2442	0.3097
	15.49	58.23	0.2004	1.364	2.54	1.43	0.0435	0.3762	2.5500	-0.2446	0.3173
	16.02	58.14	0.2002	1.363	2.42	1.34	0.0404	0.3377	2.5146	-0.2317	0.3276
	16.49	57.72	0.1995	1.358	2.42	1.35	0.0408	0.3425	2.5150	-0.2266	0.3308
	17.00	58.10	0.2001	1.362	2.53	1.43	0.0438	0.3765	2.5171	-0.2254	0.3347
	17.52	58.17	0.2003	1.362	2.42	1.35	0.0406	0.3378	2.4785	-0.2115	0.3341
	17.99	58.09	0.2001	1.361	2.54	1.43	0.0436	0.3765	2.4312	-0.2335	0.3437
	18.50	58.00	0.2000	1.360	2.41	1.34	0.0404	0.3364	2.3808	-0.2485	0.3641
	19.00	58.08	0.2001	1.360	2.46	1.37	0.0415	0.3510	2.3887	-0.2413	0.3757

Table C49. Aerodynamic Data Summary for Run 110 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
110 (HELP-10C^)	-4.01	58.06	0.2001	1.358	2.08	1.13	0.0336	0.2457	0.9215	-0.3928	0.1520
	0.03	57.88	0.1998	1.356	1.99	1.08	0.0323	0.2250	1.3096	-0.3914	0.1642
	2.02	58.12	0.2002	1.358	2.09	1.14	0.0338	0.2475	1.5002	-0.3805	0.1768
	4.01	58.14	0.2002	1.358	2.00	1.09	0.0322	0.2256	1.6385	-0.3582	0.1883
	6.02	57.96	0.1999	1.356	2.00	1.09	0.0327	0.2288	1.7916	-0.3342	0.2042
	7.00	58.08	0.2001	1.358	2.10	1.14	0.0341	0.2500	1.8972	-0.3297	0.2174
	7.99	58.06	0.2001	1.357	2.00	1.09	0.0322	0.2270	1.9556	-0.3131	0.2249
	9.00	58.06	0.2001	1.357	2.01	1.10	0.0326	0.2298	2.0353	-0.3018	0.2357
	10.00	58.05	0.2000	1.356	2.02	1.11	0.0330	0.2334	2.1088	-0.2891	0.2464
	10.99	57.94	0.1999	1.355	2.02	1.11	0.0331	0.2346	2.1797	-0.2765	0.2561
	12.01	57.97	0.1999	1.355	2.02	1.11	0.0331	0.2345	2.2454	-0.2633	0.2669
	13.00	57.78	0.1996	1.352	2.03	1.11	0.0331	0.2370	2.3124	-0.2511	0.2768
	13.99	58.16	0.2003	1.357	2.03	1.12	0.0335	0.2360	2.3610	-0.2361	0.2861
	15.01	57.94	0.1998	1.354	2.06	1.12	0.0332	0.2417	2.4346	-0.2214	0.2995
	15.49	58.32	0.2005	1.359	2.10	1.15	0.0339	0.2492	2.4623	-0.2138	0.3046
	16.02	57.88	0.1997	1.354	2.00	1.10	0.0328	0.2307	2.4362	-0.2013	0.3164
	16.49	58.07	0.2001	1.356	2.01	1.10	0.0327	0.2304	2.4395	-0.1938	0.3192
	17.00	57.87	0.1997	1.353	2.08	1.13	0.0334	0.2466	2.4500	-0.1931	0.3245
	17.50	57.95	0.1999	1.354	2.03	1.14	0.0345	0.2410	2.4237	-0.1832	0.3249
	17.99	57.93	0.1998	1.353	1.98	1.09	0.0324	0.2262	2.3691	-0.1843	0.3290
	18.50	58.04	0.2000	1.354	2.11	1.16	0.0347	0.2553	2.3317	-0.2251	0.3545
	19.00	57.90	0.1998	1.352	2.00	1.09	0.0325	0.2291	2.3193	-0.2212	0.3704

Table C50. Aerodynamic Data Summary for Run 111 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	Re (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
111 (HELP-8C^)	0.01	58.12	0.2002	1.355	2.03	0.90	0.0261	0.1901	1.2355	-0.3282	0.1630
	4.01	58.34	0.2006	1.357	2.12	0.95	0.0278	0.2080	1.5798	-0.2979	0.1871
	8.01	57.68	0.1994	1.349	2.02	0.89	0.0260	0.1893	1.8876	-0.2526	0.2227
	12.01	58.22	0.2004	1.355	2.14	0.95	0.0276	0.2106	2.1983	-0.2087	0.2660
	16.00	57.92	0.1998	1.351	2.03	0.90	0.0262	0.1911	2.3756	-0.1428	0.3132

Table C51. Aerodynamic Data Summary for Run 113 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
113 (HELP-8C^)	-3.99	58.84	0.2001	1.481	2.43	1.12	0.0324	0.2725	0.8998	-0.3415	0.1584
	-0.01	58.68	0.1999	1.476	2.52	1.14	0.0323	0.2882	1.3211	-0.3464	0.1717
	2.01	58.68	0.1999	1.476	2.43	1.12	0.0325	0.2725	1.4734	-0.3278	0.1824
	4.01	58.70	0.1999	1.472	2.47	1.14	0.0336	0.2839	1.6394	-0.3110	0.1962
	6.02	58.80	0.2001	1.472	2.41	1.09	0.0310	0.2629	1.7852	-0.2872	0.2120
	7.00	58.36	0.1993	1.466	2.42	1.09	0.0314	0.2672	1.8702	-0.2770	0.2225
	8.01	58.51	0.1996	1.459	2.52	1.13	0.0321	0.2873	1.9712	-0.2695	0.2354
	9.00	59.14	0.2007	1.466	2.44	1.11	0.0315	0.2687	2.0318	-0.2576	0.2440
	10.00	58.76	0.2000	1.461	2.44	1.11	0.0318	0.2709	2.1070	-0.2450	0.2550
	11.01	59.01	0.2004	1.463	2.42	1.09	0.0310	0.2643	2.1767	-0.2317	0.2652
	12.01	58.48	0.1995	1.453	2.43	1.10	0.0316	0.2710	2.2505	-0.2188	0.2763
	13.02	58.32	0.1992	1.451	2.44	1.10	0.0318	0.2738	2.3098	-0.2060	0.2865
	14.01	59.08	0.2006	1.460	2.45	1.11	0.0317	0.2713	2.3573	-0.1911	0.2956
	15.02	58.61	0.1997	1.455	2.46	1.12	0.0321	0.2777	2.4121	-0.1742	0.3059
	15.49	58.58	0.1997	1.454	2.48	1.12	0.0321	0.2804	2.4519	-0.1647	0.3135
	16.02	58.52	0.1996	1.450	2.39	1.07	0.0306	0.2593	2.4498	-0.1535	0.3148
	16.51	58.78	0.2001	1.453	2.51	1.11	0.0311	0.2814	2.4411	-0.1522	0.3293
	17.00	58.55	0.1996	1.449	2.51	1.12	0.0319	0.2866	2.4354	-0.1469	0.3316
	17.50	58.92	0.2003	1.453	2.40	1.11	0.0324	0.2682	2.4078	-0.1372	0.3317
	17.50	58.91	0.2003	1.453	2.42	1.09	0.0313	0.2652	2.4084	-0.1369	0.3314
	18.01	58.45	0.1995	1.447	2.42	1.10	0.0316	0.2693	2.3607	-0.1438	0.3371

Table C52. Aerodynamic Data Summary for Run 114 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
114 (HELP-8C-ST^)	-4.01	59.07	0.2006	1.447	2.30	1.02	0.0339	0.2338	0.8775	-0.3293	0.1587
	0.03	58.71	0.1999	1.441	2.41	1.07	0.0302	0.2604	1.3129	-0.3366	0.1723
	2.01	58.41	0.1994	1.438	2.29	1.01	0.0286	0.2367	1.4554	-0.3175	0.1818
	4.01	58.51	0.1996	1.436	2.30	1.02	0.0288	0.2381	1.6153	-0.2993	0.1955
	6.00	58.97	0.2004	1.442	2.33	1.02	0.0282	0.2388	1.7742	-0.2780	0.2117
	7.02	59.02	0.2005	1.441	2.41	1.06	0.0299	0.2575	1.8741	-0.2714	0.2243
	8.03	58.45	0.1995	1.433	2.30	1.02	0.0288	0.2392	1.9429	-0.2584	0.2337
	9.00	58.92	0.2003	1.438	2.31	1.02	0.0287	0.2382	2.0178	-0.2484	0.2441
	10.02	58.84	0.2002	1.437	2.31	1.02	0.0288	0.2393	2.0927	-0.2365	0.2551
	11.01	59.18	0.2008	1.440	2.40	1.06	0.0296	0.2545	2.1788	-0.2250	0.2673
	12.01	59.19	0.2008	1.439	2.30	1.02	0.0283	0.2348	2.2319	-0.2087	0.2757
	13.02	58.88	0.2002	1.435	2.31	1.02	0.0287	0.2386	2.2911	-0.1951	0.2859
	14.01	58.91	0.2003	1.435	2.35	1.03	0.0286	0.2439	2.3441	-0.1807	0.2953
	15.03	58.56	0.1997	1.431	2.41	1.07	0.0304	0.2626	2.4141	-0.1647	0.3084
	15.03	58.65	0.1998	1.430	2.32	1.03	0.0291	0.2428	2.3955	-0.1615	0.3053
	15.49	58.52	0.1996	1.428	2.41	1.06	0.0294	0.2600	2.4432	-0.1547	0.3138
	16.02	58.72	0.2000	1.429	2.30	1.02	0.0286	0.2380	2.4374	-0.1420	0.3143
	16.51	58.77	0.2001	1.429	2.31	1.02	0.0286	0.2386	2.4189	-0.1370	0.3274
	17.00	58.51	0.1996	1.425	2.37	1.03	0.0286	0.2499	2.4230	-0.1331	0.3312
	17.50	58.75	0.2000	1.429	2.42	1.07	0.0300	0.2617	2.4069	-0.1284	0.3325
	18.03	58.86	0.2002	1.429	2.30	1.02	0.0284	0.2362	2.3433	-0.1294	0.3343
	18.50	58.76	0.2000	1.428	2.30	1.02	0.0286	0.2385	2.2938	-0.1507	0.3484
	19.00	58.63	0.1998	1.426	2.41	1.07	0.0303	0.2629	2.3012	-0.1506	0.3641

Table C53. Aerodynamic Data Summary for Run 115 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
115 (HELP-10C-ST^)	-3.99	58.96	0.2004	1.422	2.03	1.07	0.0275	0.2188	0.9147	-0.3679	0.1557
	0.03	58.75	0.2000	1.417	2.00	1.03	0.0259	0.2095	1.3224	-0.3725	0.1699
	2.01	58.75	0.2000	1.417	1.94	1.01	0.0256	0.1987	1.4692	-0.3504	0.1803
	3.99	58.51	0.1996	1.412	2.02	1.05	0.0273	0.2181	1.6458	-0.3367	0.1940
	6.00	58.77	0.2000	1.415	1.94	1.00	0.0255	0.1975	1.7732	-0.3062	0.2080
	7.02	58.77	0.2000	1.415	1.94	1.00	0.0256	0.1983	1.8612	-0.2951	0.2192
	8.03	58.39	0.1994	1.409	1.94	1.00	0.0257	0.2006	1.9378	-0.2814	0.2293
	9.02	58.55	0.1997	1.411	2.03	1.06	0.0274	0.2194	2.0357	-0.2761	0.2425
	10.02	58.56	0.1997	1.411	1.94	1.00	0.0256	0.1992	2.0802	-0.2552	0.2491
	11.01	58.78	0.2001	1.414	1.94	1.01	0.0257	0.1994	2.1519	-0.2396	0.2591
	12.01	58.67	0.1999	1.410	1.95	1.01	0.0258	0.2020	2.2179	-0.2240	0.2691
	13.00	58.78	0.2001	1.411	2.02	1.05	0.0270	0.2158	2.2893	-0.2118	0.2804
	14.01	58.81	0.2001	1.411	2.02	1.05	0.0272	0.2162	2.3336	-0.1948	0.2880
	15.01	58.78	0.2001	1.411	1.94	1.00	0.0253	0.1974	2.3517	-0.1671	0.2930
	15.49	58.74	0.2000	1.410	1.94	1.01	0.0256	0.1994	2.3897	-0.1531	0.2991
	16.00	58.66	0.1999	1.410	1.94	1.02	0.0261	0.2019	2.4015	-0.1432	0.3020
	16.49	58.70	0.1999	1.410	1.95	1.01	0.0256	0.2003	2.3950	-0.1379	0.3167
	17.00	58.78	0.2001	1.411	2.04	1.06	0.0270	0.2198	2.4102	-0.1394	0.3219
	17.50	58.85	0.2002	1.412	1.95	1.02	0.0258	0.2018	2.3760	-0.1240	0.3209
	17.99	58.50	0.1996	1.407	1.96	1.02	0.0260	0.2045	2.3369	-0.1268	0.3240
	18.50	58.78	0.2001	1.410	2.00	1.03	0.0262	0.2108	2.2755	-0.1702	0.3466
	19.00	58.64	0.1998	1.409	2.01	1.04	0.0265	0.2134	2.2831	-0.1629	0.3578

Table C54. Aerodynamic Data Summary for Run 116 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
116 (HELP-10C-ST^)	0.01	58.81	0.2001	1.406	2.06	1.08	0.0283	0.2267	1.3332	-0.3761	0.1713
	2.02	58.54	0.1997	1.403	1.96	1.04	0.0273	0.2097	1.4764	-0.3531	0.1807
	4.01	58.61	0.1998	1.403	1.97	1.03	0.0268	0.2089	1.6339	-0.3339	0.1937
	4.01	58.76	0.2001	1.405	1.98	1.04	0.0270	0.2093	1.6358	-0.3349	0.1938
	6.00	58.87	0.2003	1.406	1.98	1.04	0.0269	0.2090	1.7856	-0.3110	0.2094
	7.00	58.46	0.1995	1.401	2.00	1.04	0.0271	0.2147	1.8751	-0.3009	0.2210
	8.01	58.55	0.1997	1.402	2.05	1.08	0.0283	0.2264	1.9692	-0.2921	0.2331
	9.00	59.02	0.2005	1.407	2.04	1.08	0.0285	0.2239	2.0405	-0.2791	0.2426
	10.00	58.74	0.2000	1.403	1.96	1.02	0.0263	0.2040	2.0857	-0.2573	0.2495
	10.99	58.03	0.1988	1.394	1.96	1.02	0.0266	0.2083	2.1587	-0.2441	0.2602
	12.01	59.04	0.2006	1.406	2.07	1.08	0.0284	0.2278	2.2516	-0.2360	0.2738
	13.00	58.75	0.2001	1.402	1.97	1.03	0.0266	0.2075	2.2818	-0.2113	0.2789
	13.99	58.43	0.1995	1.398	1.98	1.03	0.0269	0.2103	2.3268	-0.1945	0.2870
	15.01	58.79	0.2001	1.402	1.98	1.04	0.0268	0.2092	2.3705	-0.1734	0.2957
	15.51	58.86	0.2003	1.403	2.03	1.05	0.0271	0.2172	2.4199	-0.1649	0.3044
	16.00	58.51	0.1996	1.399	2.05	1.06	0.0277	0.2245	2.4381	-0.1596	0.3080
	16.49	58.73	0.2000	1.401	2.05	1.07	0.0279	0.2244	2.4222	-0.1519	0.3205
	17.00	58.90	0.2003	1.403	1.97	1.02	0.0263	0.2057	2.3968	-0.1362	0.3207
	17.50	58.57	0.1998	1.399	1.98	1.03	0.0269	0.2098	2.3889	-0.1305	0.3230
	17.99	58.57	0.1997	1.400	2.03	1.03	0.0264	0.2159	2.3496	-0.1411	0.3272
	17.99	58.73	0.2000	1.401	2.07	1.09	0.0286	0.2299	2.3522	-0.1448	0.3271
	18.50	58.71	0.2000	1.400	1.97	1.03	0.0268	0.2088	2.2786	-0.1659	0.3433
	19.00	58.62	0.1998	1.399	1.98	1.03	0.0268	0.2092	2.2788	-0.1610	0.3570

Table C55. Aerodynamic Data Summary for Run 117 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
	-4.01	59.94	0.2021	1.414	1.0	0	0	0	0.2632	-0.1867	0.1444
	0.01	58.66	0.1999	1.398	1.0	0	0	0	0.7928	-0.2280	0.1393
	2.01	58.16	0.1990	1.392	1.0	0	0	0	0.9600	-0.2119	0.1416
	4.01	57.72	0.1982	1.387	1.0	0	0	0	1.1248	-0.1936	0.1494
	6.00	57.37	0.1976	1.382	1.0	0	0	0	1.2792	-0.1727	0.1588
	7.00	56.96	0.1969	1.378	1.0	0	0	0	1.3584	-0.1620	0.1653
	8.01	58.45	0.1995	1.395	1.0	0	0	0	1.4370	-0.1491	0.1716
	9.01	58.55	0.1997	1.396	1.0	0	0	0	1.5185	-0.1394	0.1804
	10.00	58.67	0.1999	1.397	1.0	0	0	0	1.5955	-0.1281	0.1889
117	11.01	58.59	0.1998	1.396	1.0	0	0	0	1.6685	-0.1155	0.1979
	12.01	58.66	0.1999	1.397	1.0	0	0	0	1.7359	-0.1014	0.2069
(AFC-off, repeat)	12.98	58.80	0.2001	1.399	1.0	0	0	0	1.8025	-0.0883	0.2160
	13.99	58.60	0.1998	1.396	1.0	0	0	0	1.8641	-0.0739	0.2257
	15.01	58.57	0.1997	1.395	1.0	0	0	0	1.9299	-0.0606	0.2377
	15.50	58.46	0.1996	1.394	1.0	0	0	0	1.9582	-0.0531	0.2428
	16.00	58.84	0.2002	1.398	1.0	0	0	0	1.9843	-0.0447	0.2480
	16.49	58.67	0.1999	1.395	1.0	0	0	0	2.0176	-0.0343	0.2534
	17.00	58.57	0.1997	1.395	1.0	0	0	0	2.0476	-0.0293	0.2743
	17.50	58.90	0.2003	1.399	1.0	0	0	0	2.0732	-0.0205	0.2815
	17.99	58.93	0.2004	1.399	1.0	0	0	0	2.0842	-0.0127	0.2884
	18.48	58.53	0.1997	1.394	1.0	0	0	0	2.0890	-0.0093	0.2951
	19.00	58.80	0.2002	1.397	1.0	0	0	0	2.0738	-0.0190	0.3057

Table C56. Aerodynamic Data Summary for Run 127 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
	-4.01	56.68	0.2000	1.343	1.91	0.10	0.0019	0.0206	0.3065	-0.1969	0.1337
	0.03	56.55	0.1998	1.341	1.69	0.08	0.0013	0.0149	0.7940	-0.2256	0.1244
	2.01	56.87	0.2003	1.344	1.91	0.10	0.0018	0.0200	0.9739	-0.2109	0.1282
	4.01	56.87	0.2004	1.343	1.69	0.08	0.0013	0.0149	1.1327	-0.1914	0.1361
	6.00	56.63	0.1999	1.340	1.92	0.10	0.0018	0.0204	1.3077	-0.1759	0.1487
	7.00	56.79	0.2002	1.341	1.69	0.08	0.0013	0.0147	1.3801	-0.1643	0.1558
	8.01	56.44	0.1996	1.337	1.76	0.08	0.0013	0.0156	1.4680	-0.1549	0.1639
	9.00	56.50	0.1997	1.337	1.91	0.10	0.0019	0.0204	1.5543	-0.1465	0.1729
127	10.00	56.57	0.1998	1.337	1.70	0.08	0.0013	0.0149	1.6264	-0.1351	0.1822
	10.99	56.64	0.1999	1.338	1.91	0.10	0.0018	0.0200	1.7102	-0.1246	0.1920
(DRSWJ-10C-R2S+R1ENS^)	11.99	56.66	0.2000	1.337	1.68	0.08	0.0013	0.0145	1.7747	-0.1113	0.2015
	13.00	56.69	0.2000	1.337	1.91	0.10	0.0018	0.0199	1.8563	-0.0998	0.2130
	14.01	56.78	0.2002	1.338	1.70	0.08	0.0013	0.0147	1.9121	-0.0852	0.2230
	15.01	56.76	0.2001	1.336	1.92	0.10	0.0018	0.0202	1.9867	-0.0733	0.2346
	15.48	56.84	0.2003	1.336	1.70	0.08	0.0013	0.0149	2.0043	-0.0649	0.2390
	16.00	56.51	0.1997	1.332	1.91	0.10	0.0019	0.0205	2.0485	-0.0588	0.2460
	16.49	56.58	0.1998	1.333	1.69	0.08	0.0013	0.0148	2.0681	-0.0486	0.2509
	17.00	56.82	0.2002	1.334	1.92	0.10	0.0019	0.0204	2.1079	-0.0452	0.2720
	17.50	56.17	0.1990	1.327	1.70	0.08	0.0013	0.0151	2.1177	-0.0367	0.2784
	17.99	56.83	0.2002	1.334	1.91	0.10	0.0018	0.0203	2.1370	-0.0314	0.2857
	18.50	56.65	0.1999	1.331	1.68	0.08	0.0013	0.0147	2.1099	-0.0314	0.2909
	19.00	56.80	0.2002	1.333	1.92	0.10	0.0018	0.0203	2.0791	-0.0718	0.3190

Table C57. Aerodynamic Data Summary for Run 128 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
128 (DRSWJ-10C-R2S+R1ENS^)	-3.99	56.78	0.2001	1.329	1.64	0.08	0.0013	0.0141	0.2987	-0.1966	0.1343
	-0.03	56.59	0.1998	1.326	1.48	0.07	0.0009	0.0107	0.7800	-0.2237	0.1244
	2.01	56.76	0.2001	1.328	1.65	0.08	0.0013	0.0141	0.9654	-0.2104	0.1282
	4.01	56.81	0.2002	1.329	1.48	0.07	0.0009	0.0105	1.1250	-0.1910	0.1360
	6.00	56.79	0.2001	1.328	1.65	0.08	0.0013	0.0142	1.2966	-0.1744	0.1473
	7.00	56.93	0.2004	1.330	1.48	0.07	0.0009	0.0102	1.3721	-0.1635	0.1554
	8.01	56.71	0.2000	1.327	1.52	0.07	0.0009	0.0108	1.4560	-0.1532	0.1635
	12.01	56.65	0.1999	1.325	1.48	0.07	0.0009	0.0105	1.7635	-0.1089	0.2015
	16.00	56.70	0.1999	1.326	1.65	0.08	0.0013	0.0141	2.0336	-0.0566	0.2448
	17.99	56.57	0.1997	1.324	1.48	0.07	0.0009	0.0104	2.1150	-0.0266	0.2837

Table C58. Aerodynamic Data Summary for Run 129 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
129 (DRSWJ-10C-ENS^)	0.01	57.07	0.1999	1.409	1.51	0.15	0.0022	0.0236	0.8123	-0.2277	0.1240
	3.99	57.18	0.2001	1.402	1.50	0.14	0.0020	0.0222	1.1577	-0.1946	0.1380
	6.00	57.14	0.2000	1.400	1.50	0.15	0.0020	0.0227	1.3249	-0.1760	0.1512
	8.01	56.94	0.1997	1.392	1.50	0.14	0.0020	0.0226	1.4916	-0.1551	0.1664
	9.00	57.11	0.2000	1.392	1.50	0.14	0.0020	0.0224	1.5723	-0.1463	0.1757
	10.00	57.21	0.2002	1.393	1.50	0.14	0.0020	0.0224	1.6522	-0.1362	0.1851
	12.01	57.24	0.2002	1.390	1.50	0.14	0.0020	0.0222	1.8050	-0.1120	0.2052
	15.01	57.19	0.2001	1.387	1.50	0.14	0.0020	0.0224	2.0122	-0.0724	0.2392
	15.98	56.96	0.1997	1.384	1.50	0.14	0.0020	0.0227	2.0691	-0.0591	0.2500
	17.00	57.16	0.2001	1.385	1.50	0.14	0.0020	0.0222	2.1194	-0.0476	0.2747
	17.99	57.29	0.2003	1.386	1.50	0.15	0.0021	0.0228	2.1509	-0.0356	0.2878

Table C59. Aerodynamic Data Summary for Run 130 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
130 (DRSWJ-10C-ENS^)	0.01	57.06	0.1999	1.375	1.99	0.22	0.0042	0.0458	0.8678	-0.2382	0.1282
	4.01	56.76	0.1994	1.368	1.98	0.22	0.0043	0.0461	1.2211	-0.2087	0.1461
	6.00	56.94	0.1997	1.368	1.99	0.22	0.0043	0.0460	1.3901	-0.1894	0.1596
	8.03	57.04	0.1999	1.366	1.98	0.22	0.0043	0.0458	1.5556	-0.1694	0.1763
	9.00	57.25	0.2003	1.367	1.99	0.22	0.0043	0.0460	1.6316	-0.1591	0.1851
	10.00	57.14	0.2001	1.366	1.99	0.22	0.0043	0.0462	1.7113	-0.1479	0.1946
	12.02	57.01	0.1998	1.363	1.99	0.22	0.0043	0.0461	1.8672	-0.1254	0.2158
	14.99	57.05	0.1999	1.362	1.99	0.22	0.0043	0.0464	2.0765	-0.0874	0.2492
	16.00	57.24	0.2003	1.363	1.99	0.22	0.0043	0.0462	2.1345	-0.0729	0.2602
	17.00	57.00	0.1998	1.359	1.99	0.22	0.0042	0.0461	2.1771	-0.0628	0.2829
	17.99	57.21	0.2002	1.361	2.00	0.22	0.0043	0.0465	2.1935	-0.0545	0.2945

Table C60. Aerodynamic Data Summary for Run 131 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
	0.01	57.02	0.1999	1.354	2.51	0.258	0.0047	0.0684	0.8864	-0.2417	0.1295
	3.99	56.92	0.1997	1.352	2.52	0.258	0.0047	0.0690	1.2464	-0.2141	0.1487
	6.00	56.98	0.1998	1.352	2.53	0.26	0.0048	0.0696	1.4176	-0.1952	0.1639
131	8.01	56.96	0.1998	1.350	2.53	0.258	0.0047	0.0692	1.5858	-0.1744	0.1811
	9.00	57.31	0.2004	1.354	2.54	0.26	0.0047	0.0692	1.6638	-0.1646	0.1904
(DRSWJ-10C-ENS^)	10.00	57.07	0.2000	1.351	2.54	0.26	0.0047	0.0698	1.7402	-0.1532	0.1998
	12.01	57.17	0.2002	1.350	2.53	0.259	0.0047	0.0692	1.8960	-0.1296	0.2206
	15.01	57.19	0.2002	1.350	2.54	0.26	0.0047	0.0695	2.1008	-0.0883	0.2531
	16.02	57.13	0.2001	1.349	2.55	0.262	0.0048	0.0705	2.1621	-0.0740	0.2649
	17.00	57.04	0.1999	1.348	2.54	0.261	0.0048	0.0701	2.1998	-0.0638	0.2881
	17.99	56.95	0.1998	1.346	2.55	0.263	0.0048	0.0710	2.2034	-0.0565	0.2977

Table C61. Aerodynamic Data Summary for Run 134 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
	-0.01	56.98	0.1999	1.358	1.0	0	0	0	0.7904	-0.2291	0.1302
	3.99	57.23	0.2003	1.358	1.0	0	0	0	1.1258	-0.1943	0.1412
	6.02	57.06	0.2000	1.356	1.0	0	0	0	1.2832	-0.1729	0.1522
134	8.01	56.77	0.1995	1.351	1.0	0	0	0	1.4414	-0.1497	0.1651
	10.02	56.92	0.1998	1.352	1.0	0	0	0	1.5992	-0.1283	0.1833
(AFC-off)	12.01	57.03	0.2000	1.353	1.0	0	0	0	1.7416	-0.1009	0.2013
	15.01	56.69	0.1994	1.348	1.0	0	0	0	1.9284	-0.0592	0.2319
	15.98	57.17	0.2002	1.353	1.0	0	0	0	1.9833	-0.0441	0.2423
	17.97	57.09	0.2001	1.352	1.0	0	0	0	2.0762	-0.0135	0.2826

Table C62. Aerodynamic Data Summary for Run 135 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
	0.01	57.00	0.2001	1.354	1.27	0.10	0.0011	0.0136	0.7940	-0.2264	0.1250
	4.01	56.67	0.1995	1.348	1.26	0.10	0.0010	0.0134	1.1352	-0.1926	0.1367
	6.02	56.96	0.2000	1.350	1.25	0.10	0.0010	0.0129	1.3026	-0.1744	0.1491
135	8.01	56.92	0.2000	1.348	1.25	0.10	0.0010	0.0128	1.4656	-0.1542	0.1637
	9.00	56.70	0.1996	1.344	1.25	0.10	0.0010	0.0132	1.5481	-0.1454	0.1727
(DRSWJ-10C-R2S^)	10.00	57.22	0.2005	1.349	1.25	0.10	0.0010	0.0130	1.6255	-0.1349	0.1820
	12.01	57.00	0.2001	1.346	1.26	0.10	0.0010	0.0130	1.7735	-0.1092	0.2014
	15.01	56.85	0.1999	1.343	1.26	0.10	0.0010	0.0131	1.9676	-0.0711	0.2330
	15.98	56.88	0.1999	1.342	1.26	0.10	0.0010	0.0132	2.0266	-0.0567	0.2441
	17.00	57.05	0.2002	1.343	1.26	0.10	0.0010	0.0132	2.0831	-0.0438	0.2708
	18.01	56.74	0.1996	1.340	1.26	0.10	0.0010	0.0131	2.1196	-0.0280	0.2846

Table C63. Aerodynamic Data Summary for Runs 136+137 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
136+137 (DRSWJ-10C-R2S^ – a combined run of Runs 136 & 137)	-3.99	56.96	0.2001	1.336	1.50	0.14	0.0021	0.0228	0.3191	-0.2003	0.1309
	0.03	56.87	0.1999	1.334	1.50	0.15	0.0021	0.0234	0.8098	-0.2285	0.1208
	2.01	56.86	0.1999	1.333	1.50	0.14	0.0020	0.0226	0.9840	-0.2138	0.1258
	4.01	56.99	0.2001	1.334	1.50	0.14	0.0020	0.0223	1.1527	-0.1967	0.1336
	6.02	56.91	0.2000	1.332	1.50	0.14	0.0021	0.0229	1.3191	-0.1791	0.1462
	6.98	56.95	0.2001	1.340	1.49	0.15	0.0021	0.0231	1.4017	-0.1685	0.1538
	8.01	57.11	0.2004	1.340	1.49	0.15	0.0021	0.0230	1.4853	-0.1594	0.1622
	9.00	56.94	0.2001	1.338	1.49	0.15	0.0021	0.0231	1.5676	-0.1507	0.1714
	10.00	56.68	0.1996	1.334	1.49	0.15	0.0021	0.0232	1.6477	-0.1403	0.1816
	10.99	57.16	0.2005	1.339	1.49	0.14	0.0021	0.0227	1.7241	-0.1278	0.1910
	11.99	57.00	0.2002	1.337	1.50	0.15	0.0021	0.0231	1.7954	-0.1154	0.2010
	13.00	56.99	0.2001	1.336	1.50	0.15	0.0021	0.0231	1.8661	-0.1035	0.2117
	13.99	56.92	0.2000	1.335	1.50	0.15	0.0021	0.0233	1.9322	-0.0906	0.2222
	15.01	56.88	0.1999	1.335	1.50	0.14	0.0021	0.0231	1.9948	-0.0771	0.2335
	15.49	56.99	0.2001	1.335	1.50	0.14	0.0020	0.0226	2.0244	-0.0705	0.2387
	16.00	56.93	0.2000	1.334	1.49	0.14	0.0020	0.0220	2.0521	-0.0626	0.2442
	16.49	56.86	0.1999	1.332	1.53	0.14	0.0021	0.0234	2.0871	-0.0572	0.2607
	17.00	56.91	0.2000	1.332	1.49	0.14	0.0020	0.0223	2.1140	-0.0494	0.2708
	17.50	56.82	0.1998	1.330	1.50	0.14	0.0021	0.0228	2.1367	-0.0419	0.2784
	18.01	56.80	0.1998	1.330	1.50	0.14	0.0019	0.0221	2.1455	-0.0362	0.2847
	18.50	56.89	0.2000	1.331	1.50	0.14	0.0020	0.0224	2.1299	-0.0378	0.2908
	19.00	56.93	0.2001	1.331	1.50	0.14	0.0020	0.0227	2.0929	-0.0742	0.3180

Table C64. Aerodynamic Data Summary for Runs 138 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
138 (DRSWJ-10C-R2S^)	0.01	56.84	0.1999	1.330	2.04	0.22	0.0044	0.0487	0.8476	-0.2371	0.1201
	4.01	56.70	0.1996	1.328	2.03	0.22	0.0043	0.0481	1.1963	-0.2064	0.1354
	6.00	56.77	0.1997	1.328	2.05	0.22	0.0044	0.0493	1.3645	-0.1882	0.1479
	7.00	56.79	0.1998	1.329	2.04	0.22	0.0044	0.0486	1.4450	-0.1783	0.1557
	7.99	57.02	0.2002	1.331	2.04	0.22	0.0043	0.0482	1.5311	-0.1687	0.1648
	10.00	56.85	0.1999	1.329	2.04	0.22	0.0044	0.0485	1.6928	-0.1496	0.1844
	11.99	57.23	0.2006	1.334	2.05	0.22	0.0044	0.0485	1.8443	-0.1257	0.2050
	15.03	57.06	0.2003	1.332	2.04	0.22	0.0044	0.0487	2.0494	-0.0869	0.2397
	16.00	57.08	0.2003	1.331	2.04	0.22	0.0044	0.0487	2.1079	-0.0731	0.2507
	16.98	56.96	0.2001	1.331	2.04	0.22	0.0044	0.0486	2.1637	-0.0610	0.2759
	17.99	56.68	0.1996	1.327	2.04	0.22	0.0044	0.0489	2.1843	-0.0493	0.2893

Table C65. Aerodynamic Data Summary for Run 139 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
139 (DRSWJ-10C^)	0.01	56.92	0.2000	1.344	1.50	0.273	0.0037	0.0435	0.8979	-0.2576	0.12596
	3.99	56.98	0.2001	1.346	1.51	0.274	0.0037	0.0437	1.2626	-0.2259	0.14726
	6.00	56.71	0.1996	1.342	1.51	0.272	0.0037	0.0437	1.4194	-0.2081	0.15899
	7.00	56.89	0.1999	1.344	1.51	0.274	0.0038	0.0439	1.5031	-0.1979	0.16713
	8.01	57.15	0.2004	1.346	1.51	0.273	0.0037	0.0434	1.5824	-0.1880	0.17577
	10.02	56.86	0.1999	1.343	1.51	0.272	0.0037	0.0435	1.7422	-0.1655	0.19485
	12.01	56.83	0.1998	1.342	1.50	0.27	0.0037	0.0432	1.8929	-0.1420	0.21466
	15.01	56.87	0.1999	1.344	1.51	0.271	0.0037	0.0434	2.0998	-0.1024	0.24821
	16.02	56.89	0.1999	1.343	1.51	0.272	0.0037	0.0436	2.1563	-0.0884	0.25844
	17.00	56.90	0.1999	1.343	1.52	0.273	0.0037	0.0439	2.1963	-0.0773	0.28127
	17.99	57.09	0.2003	1.345	1.51	0.27	0.0037	0.0430	2.2015	-0.0682	0.29135

Table C66. Aerodynamic Data Summary for Run 140 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
140 (DRSWJ-10C^)	-3.99	57.34	0.2001	1.435	2.00	0.384	0.0063	0.0789	0.5393	-0.2624	0.1359
	-0.01	57.39	0.2002	1.433	2.00	0.38	0.0062	0.0782	1.0064	-0.2865	0.1378
	2.01	56.90	0.1993	1.426	2.00	0.381	0.0062	0.0795	1.1960	-0.2743	0.1486
	4.01	57.28	0.2000	1.429	2.00	0.377	0.0061	0.0777	1.3637	-0.2545	0.1591
	6.00	57.29	0.2000	1.429	2.00	0.379	0.0062	0.0783	1.5281	-0.2337	0.1731
	7.00	57.36	0.2001	1.427	2.00	0.376	0.0061	0.0774	1.6066	-0.2231	0.1816
	8.01	57.78	0.2009	1.432	2.01	0.38	0.0062	0.0776	1.6883	-0.2123	0.1912
	8.98	57.70	0.2007	1.428	2.00	0.373	0.0060	0.0763	1.7674	-0.2015	0.2003
	10.00	56.83	0.1992	1.418	2.01	0.373	0.0060	0.0782	1.8481	-0.1898	0.2104
	11.01	57.21	0.1998	1.420	1.99	0.369	0.0060	0.0758	1.9191	-0.1762	0.2198
	11.99	57.14	0.1997	1.419	1.99	0.373	0.0061	0.0770	1.9945	-0.1639	0.2298
	13.00	57.03	0.1995	1.416	2.00	0.37	0.0060	0.0770	2.0682	-0.1517	0.2400
	14.00	57.41	0.2002	1.420	2.00	0.371	0.0060	0.0766	2.1348	-0.1382	0.2506
	15.01	57.33	0.2001	1.417	1.97	0.365	0.0059	0.0745	2.1848	-0.1243	0.2608
	15.49	57.31	0.2000	1.417	1.98	0.368	0.0060	0.0753	2.2144	-0.1170	0.2659
	16.02	57.27	0.1999	1.415	1.99	0.366	0.0059	0.0754	2.2533	-0.1069	0.2729
	16.49	57.30	0.2000	1.415	1.99	0.371	0.0060	0.0765	2.2743	-0.1010	0.2773
	17.00	57.45	0.2003	1.415	1.98	0.367	0.0059	0.0750	2.2634	-0.0981	0.2931
	17.52	57.38	0.2001	1.413	1.99	0.366	0.0059	0.0752	2.2696	-0.0930	0.2977
	17.99	57.43	0.2002	1.412	1.99	0.368	0.0059	0.0756	2.2541	-0.0910	0.3015
	18.50	57.26	0.1999	1.410	2.00	0.372	0.0060	0.0770	2.1919	-0.1188	0.3172
	19.00	57.27	0.1999	1.410	2.01	0.372	0.0060	0.0773	2.1744	-0.1408	0.3404

Table C67. Aerodynamic Data Summary for Run 141 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
	-3.99	57.33	0.2000	1.401	2.50	0.475	0.0079	0.1231	0.5987	-0.2730	0.1388
	-0.01	56.99	0.1994	1.397	2.50	0.479	0.0081	0.1256	1.0614	-0.2981	0.1432
	2.01	57.23	0.1999	1.398	2.47	0.47	0.0078	0.1210	1.2417	-0.2833	0.1520
	4.01	57.24	0.1999	1.398	2.48	0.473	0.0079	0.1221	1.4088	-0.2662	0.1644
	6.02	57.31	0.2000	1.398	2.48	0.471	0.0079	0.1215	1.5772	-0.2428	0.1787
	7.01	57.47	0.2003	1.399	2.49	0.475	0.0079	0.1223	1.6573	-0.2327	0.1880
	8.01	57.35	0.2001	1.397	2.50	0.475	0.0079	0.1234	1.7406	-0.2234	0.1976
	9.00	56.99	0.1994	1.392	2.51	0.477	0.0080	0.1253	1.8220	-0.2127	0.2073
	10.00	57.58	0.2005	1.398	2.48	0.474	0.0079	0.1216	1.8942	-0.1985	0.2168
141	11.01	57.12	0.1997	1.393	2.49	0.476	0.0080	0.1240	1.9722	-0.1862	0.2274
	12.01	57.73	0.2008	1.399	2.49	0.474	0.0079	0.1215	2.0438	-0.1726	0.2377
(DRSWJ-10C^)	13.00	57.19	0.1998	1.392	2.50	0.477	0.0080	0.1243	2.1174	-0.1595	0.2485
	14.01	57.46	0.2003	1.395	2.49	0.473	0.0078	0.1221	2.1793	-0.1461	0.2582
	15.01	57.35	0.2001	1.393	2.50	0.479	0.0081	0.1243	2.2380	-0.1327	0.2704
	15.49	57.39	0.2001	1.393	2.49	0.474	0.0079	0.1225	2.2625	-0.1243	0.2738
	16.00	57.41	0.2002	1.393	2.49	0.478	0.0080	0.1238	2.3002	-0.1137	0.2806
	16.49	57.37	0.2001	1.392	2.48	0.472	0.0078	0.1219	2.2949	-0.1125	0.2954
	17.00	57.12	0.1997	1.389	2.49	0.478	0.0081	0.1245	2.3000	-0.1057	0.2993
	17.52	57.41	0.2002	1.391	2.49	0.476	0.0079	0.1234	2.2961	-0.0994	0.3025
	17.99	57.32	0.2000	1.390	2.50	0.477	0.0080	0.1242	2.2698	-0.0983	0.3059
	18.50	57.18	0.1998	1.387	2.49	0.474	0.0079	0.1234	2.1979	-0.1374	0.3269
	19.00	57.21	0.1998	1.387	2.49	0.478	0.0080	0.1246	2.1921	-0.1501	0.3477

Table C68. Aerodynamic Data Summary for Run 142 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
	-3.99	57.33	0.2000	1.385	1.51	0.275	0.0037	0.0432	0.4231	-0.2274	0.13182
	0.03	57.28	0.1999	1.384	1.51	0.276	0.0037	0.0434	0.9071	-0.2551	0.12824
	2.01	57.12	0.1996	1.382	1.51	0.276	0.0037	0.0436	1.0933	-0.2433	0.13751
	4.01	57.30	0.1999	1.382	1.51	0.276	0.0037	0.0434	1.2692	-0.2240	0.14917
	6.00	57.22	0.1998	1.381	1.51	0.276	0.0037	0.0436	1.4265	-0.2067	0.16113
	7.00	57.51	0.2003	1.384	1.51	0.276	0.0037	0.0434	1.5069	-0.1960	0.16837
	8.01	57.15	0.1997	1.378	1.51	0.274	0.0037	0.0433	1.5899	-0.1857	0.17743
	9.00	57.15	0.1997	1.378	1.51	0.275	0.0037	0.0435	1.6693	-0.1761	0.18679
	10.00	57.29	0.1999	1.380	1.51	0.274	0.0037	0.0432	1.7474	-0.1643	0.19658
142	10.99	57.16	0.1997	1.378	1.51	0.275	0.0037	0.0436	1.8243	-0.1525	0.20726
	12.01	57.22	0.1998	1.377	1.51	0.274	0.0037	0.0433	1.8980	-0.1407	0.21730
(DRSWJ-10C^)	13.00	57.28	0.1999	1.377	1.51	0.274	0.0037	0.0433	1.9719	-0.1270	0.22779
	13.99	57.38	0.2001	1.378	1.51	0.276	0.0037	0.0436	2.0431	-0.1132	0.23928
	14.99	57.49	0.2003	1.379	1.51	0.274	0.0037	0.0432	2.1043	-0.1010	0.25004
	15.49	57.35	0.2000	1.377	1.52	0.277	0.0038	0.0439	2.1340	-0.0956	0.25577
	16.00	57.25	0.1999	1.375	1.51	0.274	0.0037	0.0434	2.1635	-0.0874	0.26116
	16.49	57.16	0.1997	1.374	1.52	0.277	0.0038	0.0442	2.1946	-0.0804	0.26739
	17.00	57.31	0.1999	1.375	1.51	0.272	0.0036	0.0430	2.2001	-0.0762	0.28429
	17.50	57.31	0.2000	1.375	1.51	0.274	0.0037	0.0434	2.2100	-0.0716	0.28995
	17.99	57.16	0.1997	1.372	1.52	0.275	0.0037	0.0438	2.2099	-0.0682	0.29418
	18.50	57.17	0.1997	1.373	1.52	0.276	0.0037	0.0440	2.1657	-0.0853	0.30568
	19.00	57.31	0.2000	1.374	1.52	0.274	0.0037	0.0435	2.1385	-0.1144	0.33274

Table C69. Aerodynamic Data Summary for Run 143 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
143 (DRSWJ-10C^)	-3.99	57.59	0.2004	1.374	1.76	0.355	0.0059	0.0650	0.4888	-0.2463	0.1333
	0.03	57.27	0.1999	1.370	1.76	0.351	0.0058	0.0646	0.9663	-0.2733	0.1337
	2.01	56.98	0.1993	1.366	1.76	0.353	0.0059	0.0656	1.1555	-0.2626	0.1440
	4.01	57.47	0.2002	1.373	1.76	0.352	0.0058	0.0647	1.3269	-0.2448	0.1552
	6.00	57.09	0.1995	1.368	1.77	0.354	0.0059	0.0659	1.4946	-0.2246	0.1692
	7.00	57.16	0.1997	1.368	1.75	0.35	0.0058	0.0644	1.5704	-0.2133	0.1768
	8.01	57.09	0.1995	1.367	1.75	0.35	0.0058	0.0647	1.6534	-0.2034	0.1870
	9.00	57.37	0.2000	1.370	1.76	0.349	0.0057	0.0641	1.7317	-0.1926	0.1957
	10.00	56.81	0.1990	1.363	1.76	0.352	0.0059	0.0659	1.8126	-0.1810	0.2061
	11.01	57.33	0.2000	1.368	1.75	0.35	0.0058	0.0643	1.8842	-0.1684	0.2151
	12.01	57.24	0.1998	1.367	1.76	0.35	0.0058	0.0647	1.9623	-0.1558	0.2264
	12.98	57.32	0.2000	1.368	1.75	0.354	0.0059	0.0651	2.0330	-0.1432	0.2355
	14.01	57.37	0.2000	1.369	1.76	0.35	0.0058	0.0646	2.1027	-0.1294	0.2467
	15.01	57.35	0.2000	1.368	1.76	0.351	0.0058	0.0645	2.1608	-0.1163	0.2576
	15.49	57.32	0.1999	1.368	1.76	0.349	0.0058	0.0644	2.1880	-0.1103	0.2629
	16.02	57.53	0.2003	1.370	1.76	0.348	0.0057	0.0638	2.2234	-0.1003	0.2689
	16.49	57.43	0.2002	1.369	1.76	0.351	0.0058	0.0647	2.2252	-0.0978	0.2846
	17.02	57.35	0.2000	1.368	1.76	0.348	0.0057	0.0643	2.2429	-0.0912	0.2904
	17.48	57.25	0.1998	1.367	1.77	0.35	0.0058	0.0650	2.2531	-0.0873	0.2947
	17.99	57.23	0.1998	1.365	1.76	0.346	0.0057	0.0640	2.2402	-0.0836	0.2987
	18.48	57.39	0.2001	1.367	1.76	0.35	0.0058	0.0647	2.1755	-0.1118	0.3146
	19.00	57.13	0.1996	1.364	1.76	0.345	0.0057	0.0640	2.1662	-0.1312	0.3383

Table C70. Aerodynamic Data Summary for Run 145 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
145 (DRSWJ-10C^)	-4.01	57.23	0.1999	1.377	2.99	0.573	0.0098	0.1792	0.6456	-0.2854	0.1415
	0.03	57.23	0.1999	1.376	2.98	0.57	0.0097	0.1780	1.0968	-0.3075	0.1463
	2.01	57.13	0.1997	1.374	2.99	0.574	0.0098	0.1803	1.2851	-0.2945	0.1573
	4.01	57.30	0.2000	1.373	2.98	0.577	0.0098	0.1800	1.4441	-0.2752	0.1683
	6.01	57.28	0.2000	1.372	2.99	0.58	0.0099	0.1815	1.6116	-0.2527	0.1838
	7.00	57.32	0.2001	1.371	2.99	0.58	0.0098	0.1815	1.6925	-0.2428	0.1929
	8.01	57.28	0.2000	1.367	2.98	0.583	0.0099	0.1822	1.7747	-0.2327	0.2032
	9.00	56.68	0.1989	1.361	2.99	0.585	0.0101	0.1864	1.8585	-0.2221	0.2139
	9.98	57.12	0.1997	1.364	2.98	0.582	0.0099	0.1826	1.9328	-0.2099	0.2236
	11.01	57.17	0.1998	1.364	2.99	0.583	0.0099	0.1832	2.0086	-0.1959	0.2342
	12.01	57.22	0.1999	1.364	2.99	0.578	0.0098	0.1816	2.0827	-0.1827	0.2440
	13.00	57.20	0.1998	1.363	2.99	0.58	0.0098	0.1827	2.1529	-0.1693	0.2547
	14.01	57.13	0.1997	1.361	2.97	0.576	0.0098	0.1806	2.2186	-0.1558	0.2654
	15.01	57.42	0.2002	1.365	2.98	0.575	0.0097	0.1792	2.2649	-0.1417	0.2753
	15.49	57.46	0.2003	1.366	2.98	0.578	0.0098	0.1799	2.2925	-0.1330	0.2787
	16.02	57.14	0.1997	1.362	2.99	0.579	0.0098	0.1824	2.3263	-0.1232	0.2854
	16.49	57.40	0.2002	1.364	2.98	0.579	0.0098	0.1804	2.3223	-0.1206	0.2997
	17.00	57.31	0.2000	1.363	2.99	0.578	0.0098	0.1813	2.3243	-0.1138	0.3034
	17.50	57.01	0.1995	1.359	2.99	0.577	0.0098	0.1825	2.3155	-0.1074	0.3052
	18.01	57.45	0.2003	1.364	3.00	0.581	0.0098	0.1823	2.2729	-0.1075	0.3081
	18.50	57.28	0.2000	1.360	2.99	0.576	0.0097	0.1810	2.2039	-0.1495	0.3306
	19.00	57.12	0.1997	1.358	3.00	0.579	0.0099	0.1831	2.2062	-0.1593	0.3493

Table C71. Aerodynamic Data Summary for Run 146 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
	-4.01	57.32	0.2000	1.357	2.23	0.424	0.0071	0.0992	0.5625	-0.2694	0.1396
	-0.03	57.27	0.2000	1.357	2.23	0.427	0.0071	0.1002	1.0289	-0.2953	0.1421
	2.01	57.08	0.1996	1.355	2.24	0.43	0.0072	0.1017	1.2172	-0.2821	0.1523
	4.03	57.36	0.2001	1.358	2.24	0.43	0.0072	0.1012	1.3824	-0.2635	0.1635
	6.02	57.09	0.1996	1.354	2.25	0.433	0.0073	0.1029	1.5509	-0.2424	0.1781
	7.00	57.26	0.1999	1.355	2.23	0.425	0.0071	0.0996	1.6268	-0.2314	0.1860
	8.01	57.04	0.1995	1.353	2.23	0.428	0.0072	0.1013	1.7113	-0.2210	0.1961
	9.00	57.57	0.2005	1.359	2.24	0.427	0.0071	0.0997	1.7905	-0.2098	0.2050
	10.00	57.16	0.1997	1.354	2.24	0.432	0.0073	0.1022	1.8662	-0.1974	0.2153
146	10.99	57.19	0.1998	1.355	2.23	0.425	0.0071	0.0999	1.9401	-0.1846	0.2244
	11.99	57.07	0.1996	1.353	2.24	0.429	0.0072	0.1015	2.0154	-0.1720	0.2355
(DRSWJ-10C^)	13.00	57.54	0.2004	1.358	2.23	0.426	0.0070	0.0995	2.0829	-0.1581	0.2443
	13.99	57.35	0.2001	1.356	2.24	0.43	0.0072	0.1013	2.1507	-0.1451	0.2556
	15.01	57.37	0.2001	1.357	2.23	0.428	0.0071	0.1004	2.2046	-0.1315	0.2661
	15.49	57.21	0.1998	1.355	2.24	0.428	0.0071	0.1011	2.2323	-0.1246	0.2710
	16.00	57.33	0.2000	1.356	2.23	0.425	0.0071	0.0995	2.2625	-0.1148	0.2756
	16.49	57.37	0.2001	1.356	2.24	0.427	0.0071	0.1003	2.2694	-0.1115	0.2923
	16.98	57.48	0.2003	1.357	2.24	0.423	0.0070	0.0992	2.2756	-0.1049	0.2952
	17.52	57.43	0.2002	1.356	2.24	0.426	0.0071	0.1001	2.2760	-0.0988	0.3002
	17.99	57.28	0.1999	1.354	2.24	0.423	0.0070	0.0996	2.2550	-0.0973	0.3030
	18.50	57.43	0.2002	1.358	2.24	0.426	0.0071	0.1002	2.1747	-0.1394	0.3258
	19.00	57.38	0.2001	1.355	2.24	0.423	0.0070	0.0996	2.1799	-0.1434	0.3412

Table C72. Aerodynamic Data Summary for Run 147 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
	-3.99	57.43	0.2002	1.356	1.0	0	0	0	0.2660	-0.1880	0.1420
	0.01	57.24	0.1999	1.353	1.0	0	0	0	0.7886	-0.2279	0.1366
	2.01	57.06	0.1996	1.352	1.0	0	0	0	0.9624	-0.2129	0.1396
	4.01	57.14	0.1997	1.354	1.0	0	0	0	1.1249	-0.1943	0.1466
	6.02	57.31	0.2000	1.355	1.0	0	0	0	1.2826	-0.1730	0.1563
	7.00	57.37	0.2001	1.355	1.0	0	0	0	1.3592	-0.1610	0.1622
	7.99	57.04	0.1995	1.351	1.0	0	0	0	1.4379	-0.1498	0.1689
	9.00	57.13	0.1997	1.351	1.0	0	0	0	1.5188	-0.1393	0.1772
	10.00	57.36	0.2001	1.354	1.0	0	0	0	1.5991	-0.1287	0.1867
147	10.99	57.26	0.1999	1.353	1.0	0	0	0	1.6696	-0.1154	0.1947
	11.99	57.23	0.1999	1.352	1.0	0	0	0	1.7387	-0.1010	0.2039
(AFC-off)	13.00	57.19	0.1998	1.352	1.0	0	0	0	1.8064	-0.0880	0.2143
	13.99	57.39	0.2001	1.356	1.0	0	0	0	1.8687	-0.0740	0.2241
	14.99	57.18	0.1998	1.354	1.0	0	0	0	1.9258	-0.0608	0.2345
	15.51	57.25	0.1999	1.354	1.0	0	0	0	1.9570	-0.0523	0.2408
	16.00	57.26	0.1999	1.354	1.0	0	0	0	1.9851	-0.0449	0.2460
	16.49	57.08	0.1996	1.352	1.0	0	0	0	2.0149	-0.0344	0.2514
	17.00	57.12	0.1996	1.352	1.0	0	0	0	2.0431	-0.0315	0.2722
	17.50	57.36	0.2001	1.354	1.0	0	0	0	2.0657	-0.0213	0.2794
	17.99	57.12	0.1997	1.351	1.0	0	0	0	2.0812	-0.0128	0.2862
	18.50	57.46	0.2003	1.355	1.0	0	0	0	2.0830	-0.0099	0.2929
	19.00	57.05	0.1995	1.351	1.0	0	0	0	2.0694	-0.0162	0.3018

Table C73. Aerodynamic Data Summary for Run 152 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
152 (AFC-off +SWVGs)	0.01	57.84	0.1999	1.485	1.0	0	0	0	0.7900	-0.2276	0.1331
	8.01	58.00	0.2002	1.479	1.0	0	0	0	1.4341	-0.1465	0.1674
	11.99	57.96	0.2002	1.476	1.0	0	0	0	1.7323	-0.0986	0.2036
	15.98	57.72	0.1997	1.471	1.0	0	0	0	1.9826	-0.0443	0.2457
	17.00	58.08	0.2004	1.470	1.0	0	0	0	2.0542	-0.0229	0.2585
	18.01	57.86	0.2000	1.466	1.0	0	0	0	2.0766	-0.0160	0.2865

Table C74. Aerodynamic Data Summary for Run 153 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
153 (AFC-off)	0.01	57.85	0.1999	1.461	1.0	0	0	0	0.7926	-0.2279	0.1334
	8.01	57.73	0.1997	1.457	1.0	0	0	0	1.4361	-0.1470	0.1680
	12.02	57.70	0.1997	1.455	1.0	0	0	0	1.7400	-0.0985	0.2042
	16.00	57.83	0.1999	1.455	1.0	0	0	0	1.9862	-0.0437	0.2456
	17.00	58.14	0.2005	1.457	1.0	0	0	0	2.0496	-0.0243	0.2579
	17.99	58.06	0.2003	1.455	1.0	0	0	0	2.0825	-0.0150	0.2854
	18.98	57.66	0.1996	1.448	1.0	0	0	0	2.0749	-0.0143	0.2998

Table C75. Aerodynamic Data Summary for Run 159 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
159 (APJ-10C^)	-3.99	57.76	0.2000	1.405	1.52	0.322	0.0048	0.0507	0.3551	-0.2074	0.1345
	0.03	57.95	0.2003	1.406	1.52	0.321	0.0048	0.0502	0.8591	-0.2371	0.1295
	2.01	57.78	0.2000	1.404	1.52	0.321	0.0048	0.0505	1.0359	-0.2246	0.1365
	4.01	57.77	0.2000	1.402	1.52	0.317	0.0047	0.0498	1.2039	-0.2054	0.1445
	6.02	57.77	0.2000	1.401	1.52	0.318	0.0047	0.0500	1.3729	-0.1870	0.1584
	7.00	57.55	0.1996	1.397	1.52	0.316	0.0047	0.0500	1.4566	-0.1771	0.1657
	8.01	57.91	0.2002	1.399	1.52	0.317	0.0047	0.0497	1.5423	-0.1681	0.1747
	9.00	57.49	0.1995	1.394	1.52	0.317	0.0048	0.0504	1.6219	-0.1580	0.1841
	10.00	57.75	0.1999	1.396	1.51	0.312	0.0046	0.0489	1.6950	-0.1469	0.1925
	11.01	57.87	0.2002	1.397	1.52	0.314	0.0046	0.0492	1.7719	-0.1345	0.2034
	12.01	58.03	0.2004	1.397	1.52	0.311	0.0045	0.0485	1.8467	-0.1214	0.2135
	13.00	57.75	0.1999	1.394	1.52	0.315	0.0047	0.0496	1.9180	-0.1098	0.2242
	14.01	57.90	0.2002	1.395	1.52	0.314	0.0046	0.0493	1.9842	-0.0955	0.2347
	15.01	57.70	0.1998	1.393	1.52	0.317	0.0047	0.0501	2.0455	-0.0801	0.2453
	15.49	57.68	0.1998	1.392	1.52	0.317	0.0047	0.0501	2.0703	-0.0725	0.2491
	16.00	57.67	0.1998	1.391	1.52	0.319	0.0048	0.0505	2.0991	-0.0654	0.2553
	16.49	57.60	0.1996	1.389	1.52	0.314	0.0047	0.0497	2.1289	-0.0563	0.2602
	17.00	58.03	0.2004	1.394	1.52	0.317	0.0047	0.0497	2.1481	-0.0510	0.2787
	17.50	57.88	0.2001	1.392	1.52	0.315	0.0047	0.0495	2.1590	-0.0457	0.2845
	18.01	57.76	0.1999	1.391	1.52	0.318	0.0048	0.0502	2.1626	-0.0411	0.2907
	18.50	57.72	0.1999	1.390	1.52	0.316	0.0047	0.0500	2.1216	-0.0532	0.2998
	19.00	57.65	0.1997	1.389	1.53	0.319	0.0048	0.0507	2.0933	-0.0846	0.3259

Table C76. Aerodynamic Data Summary for Run 163 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
163 (APJ-10C^)	-3.99	57.93	0.2003	1.419	2.09	0.457	0.0082	0.0981	0.4781	-0.2434	0.1408
	0.03	57.45	0.1994	1.412	2.10	0.455	0.0082	0.0990	0.9532	-0.2692	0.1387
	2.02	57.44	0.1994	1.411	2.10	0.452	0.0081	0.0984	1.1379	-0.2584	0.1476
	4.01	57.52	0.1996	1.411	2.10	0.451	0.0081	0.0980	1.3050	-0.2399	0.1582
	6.00	57.63	0.1998	1.412	2.09	0.451	0.0081	0.0976	1.4717	-0.2196	0.1719
	7.00	57.91	0.2002	1.413	2.03	0.459	0.0086	0.0958	1.5420	-0.2057	0.1786
	7.00	58.03	0.2005	1.412	2.09	0.444	0.0079	0.0952	1.5494	-0.2083	0.1795
	8.01	58.01	0.2004	1.410	2.10	0.444	0.0079	0.0955	1.6328	-0.1977	0.1893
	9.00	57.56	0.1996	1.402	2.09	0.443	0.0079	0.0963	1.7091	-0.1860	0.1976
	9.98	57.87	0.2002	1.405	2.10	0.444	0.0079	0.0959	1.7827	-0.1731	0.2067
	10.99	57.62	0.1997	1.401	2.10	0.442	0.0079	0.0961	1.8579	-0.1577	0.2155
	12.01	57.65	0.1998	1.401	2.10	0.444	0.0080	0.0966	1.9286	-0.1447	0.2259
	12.98	57.77	0.2000	1.401	2.10	0.443	0.0079	0.0962	1.9955	-0.1311	0.2349
	14.01	57.77	0.2000	1.401	2.10	0.442	0.0079	0.0962	2.0619	-0.1174	0.2458
	15.01	57.72	0.1999	1.398	2.10	0.442	0.0079	0.0962	2.1187	-0.1029	0.2559
	15.49	57.57	0.1997	1.396	2.11	0.445	0.0080	0.0974	2.1439	-0.0958	0.2608
	16.02	57.76	0.2000	1.397	2.10	0.445	0.0080	0.0969	2.1772	-0.0867	0.2664
	16.51	57.75	0.2000	1.396	2.11	0.444	0.0079	0.0970	2.2006	-0.0789	0.2714
	17.02	57.36	0.1993	1.390	2.10	0.444	0.0080	0.0975	2.2123	-0.0732	0.2894
	17.48	57.60	0.1997	1.392	2.10	0.445	0.0080	0.0973	2.2172	-0.0672	0.2937
	18.01	57.80	0.2001	1.394	2.10	0.442	0.0079	0.0960	2.2048	-0.0634	0.2980
	18.50	57.84	0.2002	1.394	2.10	0.446	0.0080	0.0969	2.1516	-0.0896	0.3128
	19.00	57.64	0.1998	1.390	2.10	0.443	0.0079	0.0967	2.1370	-0.1114	0.3369

Table C77. Aerodynamic Data Summary for Run 164 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
164 (APJ-10C^)	-4.01	57.80	0.2001	1.386	2.47	0.537	0.0098	0.1377	0.5249	-0.2605	0.1440
	-0.01	57.65	0.1998	1.383	2.47	0.538	0.0099	0.1387	0.9981	-0.2890	0.1444
	2.01	57.45	0.1994	1.381	2.48	0.54	0.0099	0.1401	1.1823	-0.2764	0.1540
	4.01	57.69	0.1999	1.384	2.47	0.537	0.0098	0.1383	1.3516	-0.2578	0.1644
	6.00	57.77	0.2000	1.385	2.48	0.538	0.0098	0.1385	1.5201	-0.2375	0.1789
	7.00	58.16	0.2007	1.387	2.48	0.539	0.0098	0.1376	1.5947	-0.2260	0.1865
	8.01	57.72	0.1999	1.382	2.48	0.547	0.0102	0.1411	1.6786	-0.2169	0.1962
	9.00	57.73	0.1999	1.381	2.48	0.536	0.0098	0.1381	1.7547	-0.2045	0.2051
	10.00	57.82	0.2001	1.382	2.48	0.538	0.0098	0.1386	1.8294	-0.1929	0.2149
	12.01	57.63	0.1998	1.380	2.49	0.538	0.0098	0.1395	1.9767	-0.1667	0.2345
	15.03	57.77	0.2000	1.381	2.49	0.54	0.0099	0.1398	2.1652	-0.1224	0.2651
	15.98	57.68	0.1998	1.379	2.48	0.537	0.0098	0.1389	2.2144	-0.1067	0.2734
	16.98	57.87	0.2002	1.381	2.49	0.539	0.0098	0.1390	2.2473	-0.0921	0.2965
	17.99	57.83	0.2001	1.379	2.49	0.536	0.0097	0.1384	2.2347	-0.0829	0.3049

Table C78. Aerodynamic Data Summary for Run 165 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
165 (APJ-10C^)	0.01	57.78	0.2000	1.375	2.96	0.642	0.0117	0.1979	1.0447	-0.3020	0.1484
	4.01	57.70	0.1999	1.374	2.97	0.647	0.0119	0.2005	1.3950	-0.2721	0.1691
	6.00	57.70	0.1999	1.374	2.96	0.653	0.0121	0.2015	1.5621	-0.2496	0.1835
	7.00	57.83	0.2001	1.375	2.96	0.654	0.0121	0.2014	1.6395	-0.2392	0.1924
	8.01	57.58	0.1997	1.372	2.96	0.64	0.0117	0.1982	1.7230	-0.2297	0.2023
	9.00	57.49	0.1995	1.371	2.96	0.641	0.0117	0.1993	1.7998	-0.2175	0.2112
	9.98	57.83	0.2001	1.374	2.97	0.66	0.0123	0.2036	1.8754	-0.2056	0.2209
	11.99	57.62	0.1997	1.372	2.97	0.656	0.0122	0.2036	2.0212	-0.1810	0.2416
	15.01	57.91	0.2003	1.376	2.97	0.645	0.0118	0.1985	2.2039	-0.1346	0.2711
	15.98	57.81	0.2001	1.374	2.97	0.645	0.0117	0.1995	2.2560	-0.1176	0.2802
	16.98	57.89	0.2002	1.374	2.96	0.639	0.0116	0.1965	2.2818	-0.1031	0.3019
	17.99	57.64	0.1998	1.370	2.97	0.644	0.0118	0.1999	2.2613	-0.0951	0.3105

Table C79. Aerodynamic Data Summary for Run 168 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
168 (DRSWJ-10C^, M_∞ = 0.15)	-0.01	32.77	0.1499	1.060	2.01	0.385	0.0110	0.1884	1.1388	-0.3296	0.1512
	4.01	32.88	0.1501	1.060	2.01	0.381	0.0108	0.1854	1.4858	-0.2951	0.1733
	6.00	32.94	0.1503	1.061	2.01	0.378	0.0107	0.1835	1.6531	-0.2740	0.1887
	7.00	32.76	0.1499	1.058	2.01	0.378	0.0107	0.1853	1.7475	-0.2659	0.2010
	7.99	33.02	0.1505	1.060	2.00	0.375	0.0106	0.1811	1.8296	-0.2553	0.2105
	9.98	32.71	0.1498	1.055	2.00	0.376	0.0108	0.1839	1.9829	-0.2326	0.2305
	12.01	32.84	0.1501	1.057	2.01	0.377	0.0108	0.1840	2.1323	-0.2059	0.2521
	15.01	32.85	0.1501	1.057	2.00	0.374	0.0106	0.1822	2.3020	-0.1626	0.2813
	15.98	32.82	0.1500	1.056	2.01	0.377	0.0107	0.1843	2.3545	-0.1471	0.3037
	17.00	32.88	0.1501	1.056	2.01	0.377	0.0107	0.1838	2.3590	-0.1327	0.3106
	17.97	32.91	0.1502	1.056	2.01	0.379	0.0108	0.1850	2.3082	-0.1246	0.3139

Table C80. Aerodynamic Data Summary for Run 169 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
169 (DRSWJ-10C^, M_∞ = 0.15)	-0.01	32.71	0.1497	1.051	1.53	0.289	0.0070	0.1083	1.0109	-0.2923	0.1414
	4.03	32.66	0.1496	1.050	1.53	0.289	0.0070	0.1086	1.3685	-0.2637	0.1636
	6.00	32.64	0.1496	1.050	1.53	0.29	0.0071	0.1090	1.5333	-0.2436	0.1773
	7.00	32.91	0.1502	1.054	1.51	0.282	0.0067	0.1034	1.6052	-0.2298	0.1845
	8.01	32.66	0.1496	1.049	1.51	0.281	0.0066	0.1042	1.6906	-0.2196	0.1941
	7.97	32.78	0.1499	1.050	1.51	0.281	0.0066	0.1037	1.6852	-0.2199	0.1913
	10.02	32.62	0.1495	1.048	1.52	0.282	0.0067	0.1053	1.8475	-0.1986	0.2137
	12.01	32.64	0.1496	1.048	1.51	0.278	0.0065	0.1029	1.9881	-0.1710	0.2311
	15.03	32.86	0.1501	1.051	1.51	0.28	0.0066	0.1029	2.1812	-0.1267	0.2639
	15.98	32.78	0.1499	1.050	1.50	0.277	0.0064	0.1018	2.2277	-0.1116	0.2831
	17.00	32.72	0.1497	1.049	1.51	0.28	0.0066	0.1035	2.2622	-0.0988	0.2956
	18.01	32.68	0.1497	1.048	1.51	0.278	0.0065	0.1030	2.2507	-0.0901	0.3018

Table C81. Aerodynamic Data Summary for Run 170 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
170 (DRSWJ-10C^, M_∞ = 0.15)	0.01	32.86	0.1501	1.050	3.01	0.591	0.0175	0.4336	1.3501	-0.3566	0.1661
	4.01	32.64	0.1495	1.046	3.00	0.592	0.0177	0.4377	1.6858	-0.3250	0.1919
	6.00	32.82	0.1500	1.049	3.01	0.593	0.0177	0.4353	1.8481	-0.3045	0.2099
	6.98	33.00	0.1504	1.052	3.01	0.593	0.0176	0.4322	1.9239	-0.2951	0.2197
	8.01	32.87	0.1501	1.049	3.01	0.594	0.0177	0.4360	2.0041	-0.2844	0.2317
	10.02	32.86	0.1501	1.049	3.01	0.589	0.0174	0.4315	2.1463	-0.2590	0.2509
	12.01	32.81	0.1499	1.048	3.01	0.592	0.0176	0.4358	2.2692	-0.2306	0.2689
	12.01	32.83	0.1500	1.048	3.02	0.594	0.0176	0.4386	2.2684	-0.2308	0.2688
	15.01	32.87	0.1501	1.049	3.01	0.591	0.0175	0.4330	2.4254	-0.1825	0.2969
	15.98	32.96	0.1503	1.051	3.02	0.595	0.0176	0.4353	2.4558	-0.1688	0.3164
	17.00	32.81	0.1499	1.048	3.02	0.598	0.0179	0.4406	2.4506	-0.1556	0.3215
	18.01	32.84	0.1500	1.048	3.02	0.596	0.0177	0.4396	2.3650	-0.1528	0.3240

Table C82. Aerodynamic Data Summary for Run 171 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
171 (AFC-off, M_∞ = 0.15)	-3.99	32.96	0.1503	1.051	1.0	0	0	0	0.2936	-0.2049	0.1406
	0.01	32.58	0.1494	1.044	1.0	0	0	0	0.7926	-0.2205	0.1384
	2.02	32.75	0.1498	1.047	1.0	0	0	0	0.9679	-0.2103	0.1396
	4.01	32.77	0.1498	1.048	1.0	0	0	0	1.1332	-0.1927	0.1479
	6.00	32.80	0.1499	1.048	1.0	0	0	0	1.2878	-0.1719	0.1563
	7.00	32.94	0.1502	1.050	1.0	0	0	0	1.3664	-0.1608	0.1631
	8.01	32.80	0.1499	1.048	1.0	0	0	0	1.4473	-0.1488	0.1705
	9.00	32.85	0.1500	1.049	1.0	0	0	0	1.5284	-0.1386	0.1791
	10.00	32.81	0.1499	1.048	1.0	0	0	0	1.6048	-0.1277	0.1875
	11.01	32.77	0.1498	1.048	1.0	0	0	0	1.6760	-0.1143	0.1967
	12.01	32.75	0.1498	1.047	1.0	0	0	0	1.7414	-0.0999	0.2063
	12.98	32.85	0.1500	1.049	1.0	0	0	0	1.8113	-0.0860	0.2170
	13.99	32.70	0.1497	1.046	1.0	0	0	0	1.8728	-0.0718	0.2276
	14.99	32.80	0.1499	1.048	1.0	0	0	0	1.9312	-0.0562	0.2378
	15.49	32.72	0.1497	1.046	1.0	0	0	0	1.9603	-0.0475	0.2435
	16.02	32.84	0.1500	1.048	1.0	0	0	0	1.9884	-0.0394	0.2492
	16.48	32.87	0.1501	1.049	1.0	0	0	0	2.0236	-0.0314	0.2678
	17.00	32.72	0.1497	1.047	1.0	0	0	0	2.0493	-0.0219	0.2753
	17.50	32.64	0.1495	1.045	1.0	0	0	0	2.0753	-0.0117	0.2834
	17.99	32.80	0.1499	1.048	1.0	0	0	0	2.0867	-0.0044	0.2898
	18.50	32.93	0.1502	1.050	1.0	0	0	0	2.0905	0.0012	0.2959
	19.02	32.71	0.1497	1.046	1.0	0	0	0	2.0838	-0.0018	0.3047

Table C83. Aerodynamic Data Summary for Run 172 without TWICS.

Run No. (Configuration)	α_u (deg)	$q_{\infty,u}$ (psf)	$M_{\infty,u}$	$Re_{,u}$ (x 10^6)	NPR (avg)	$\dot{m}$ (lbm/s)	$C_{\mu,u}$	$C_{\pi,u}$	$C_{L,u}$	$C_{m,u}$	$C_{D,u}$
	-3.99	57.91	0.2004	1.383	1.0	0	0	0	0.2722	-0.1860	0.1397
	0.01	57.66	0.2000	1.380	1.0	0	0	0	0.7979	-0.2284	0.1347
	2.01	57.53	0.1998	1.377	1.0	0	0	0	0.9663	-0.2120	0.1375
	4.01	57.72	0.2001	1.378	1.0	0	0	0	1.1279	-0.1926	0.1451
	6.02	57.57	0.1998	1.375	1.0	0	0	0	1.2870	-0.1724	0.1553
	7.00	57.69	0.2000	1.376	1.0	0	0	0	1.3636	-0.1603	0.1611
	8.01	57.74	0.2001	1.375	1.0	0	0	0	1.4421	-0.1487	0.1680
	9.00	57.58	0.1998	1.373	1.0	0	0	0	1.5243	-0.1390	0.1770
	10.00	57.11	0.1990	1.368	1.0	0	0	0	1.6001	-0.1276	0.1853
172	10.99	57.04	0.1989	1.366	1.0	0	0	0	1.6731	-0.1147	0.1944
	12.01	56.80	0.1984	1.362	1.0	0	0	0	1.7411	-0.0993	0.2039
(AFC-off)	13.00	57.11	0.1990	1.366	1.0	0	0	0	1.8115	-0.0861	0.2142
	13.99	57.70	0.2000	1.373	1.0	0	0	0	1.8716	-0.0728	0.2238
	15.01	57.44	0.1996	1.369	1.0	0	0	0	1.9341	-0.0584	0.2352
	15.49	57.71	0.2001	1.372	1.0	0	0	0	1.9635	-0.0514	0.2400
	16.02	57.70	0.2000	1.370	1.0	0	0	0	1.9913	-0.0420	0.2463
	16.49	57.63	0.1999	1.369	1.0	0	0	0	2.0231	-0.0326	0.2514
	17.00	57.55	0.1998	1.369	1.0	0	0	0	2.0562	-0.0268	0.2721
	17.52	57.75	0.2001	1.371	1.0	0	0	0	2.0780	-0.0183	0.2802
	17.99	57.59	0.1998	1.369	1.0	0	0	0	2.0892	-0.0115	0.2867
	18.50	57.69	0.2000	1.370	1.0	0	0	0	2.0919	-0.0080	0.2936
	19.00	57.84	0.2003	1.371	1.0	0	0	0	2.0759	-0.0129	0.3017

Appendix D.

CRM-SHL-AFC Aerodynamic Comparison Plots without Wall Correction

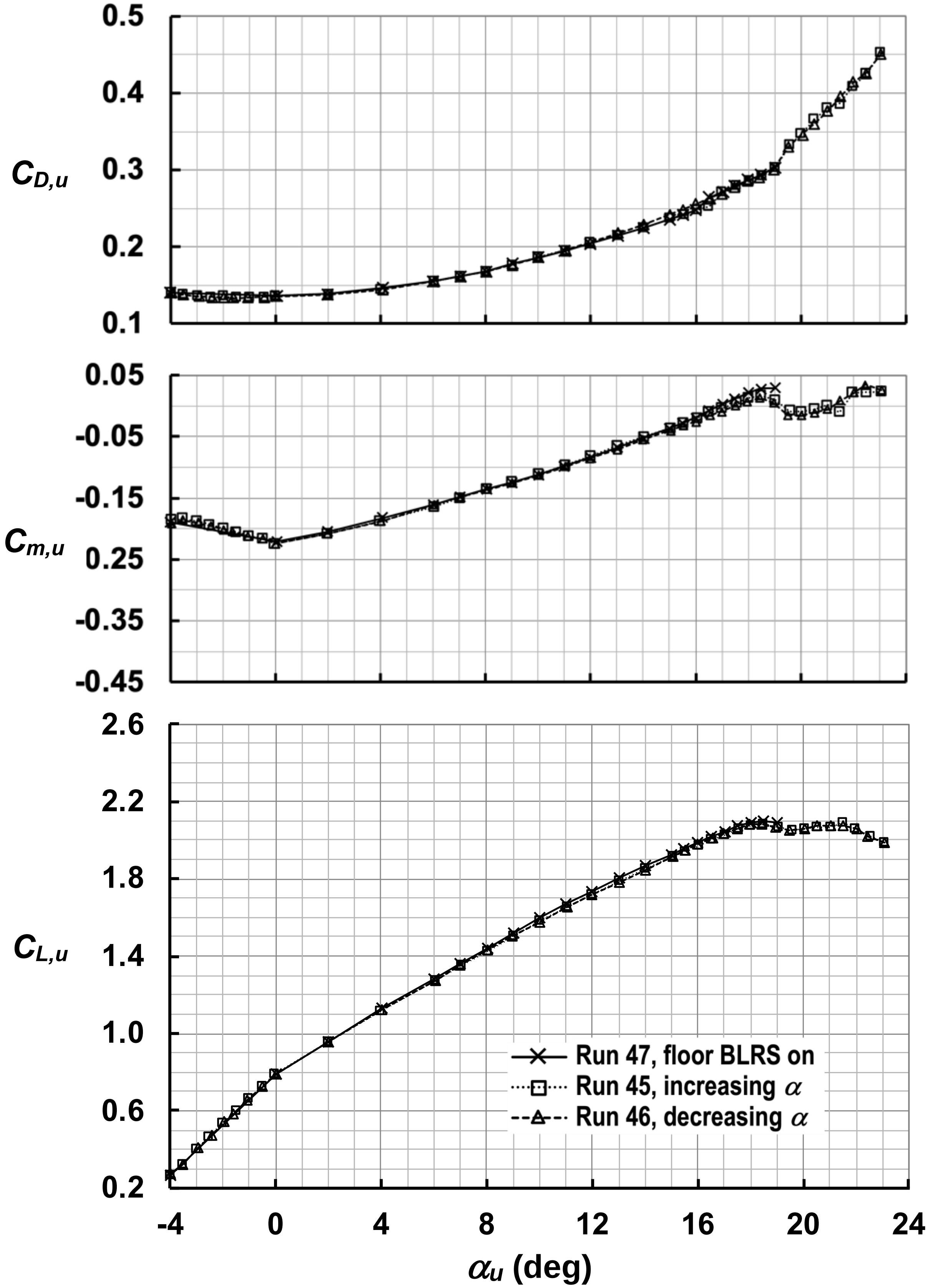


Figure D1. $C_{D,u}$, $C_{m,u}$ and $C_{L,u}$ vs. α_u plots for increasing/decreasing α with floor BLRS on (Preliminary checkout runs; AFC-off, $M_{\infty,u}$ = 0.2, without TWICS).

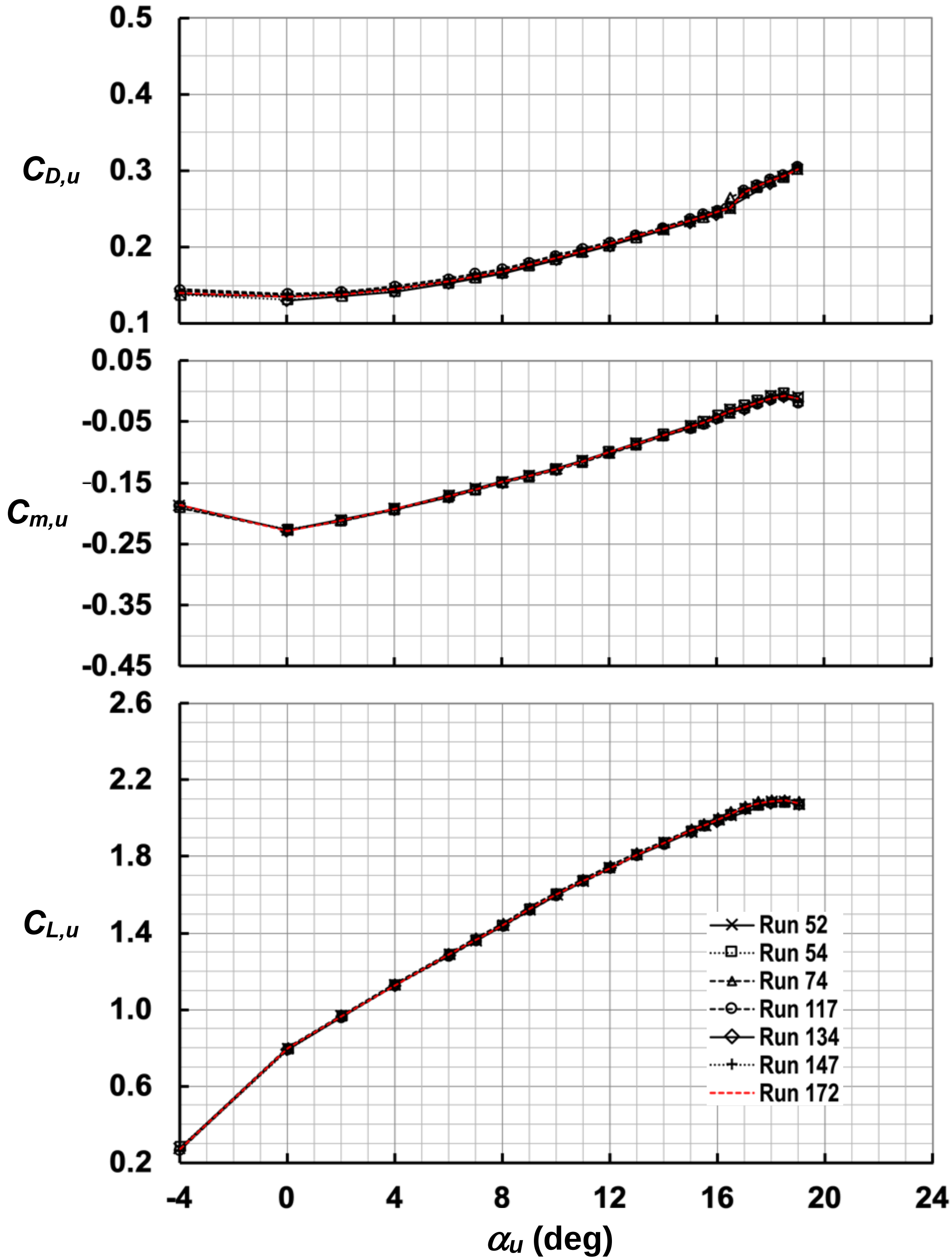


Figure D2. $C_{D,u}$, $C_{m,u}$ and $C_{L,u}$ vs. α_u plots for repeat runs without AFC (AFC-off; $M_{\infty,u}$ = 0.2, without TWICS).

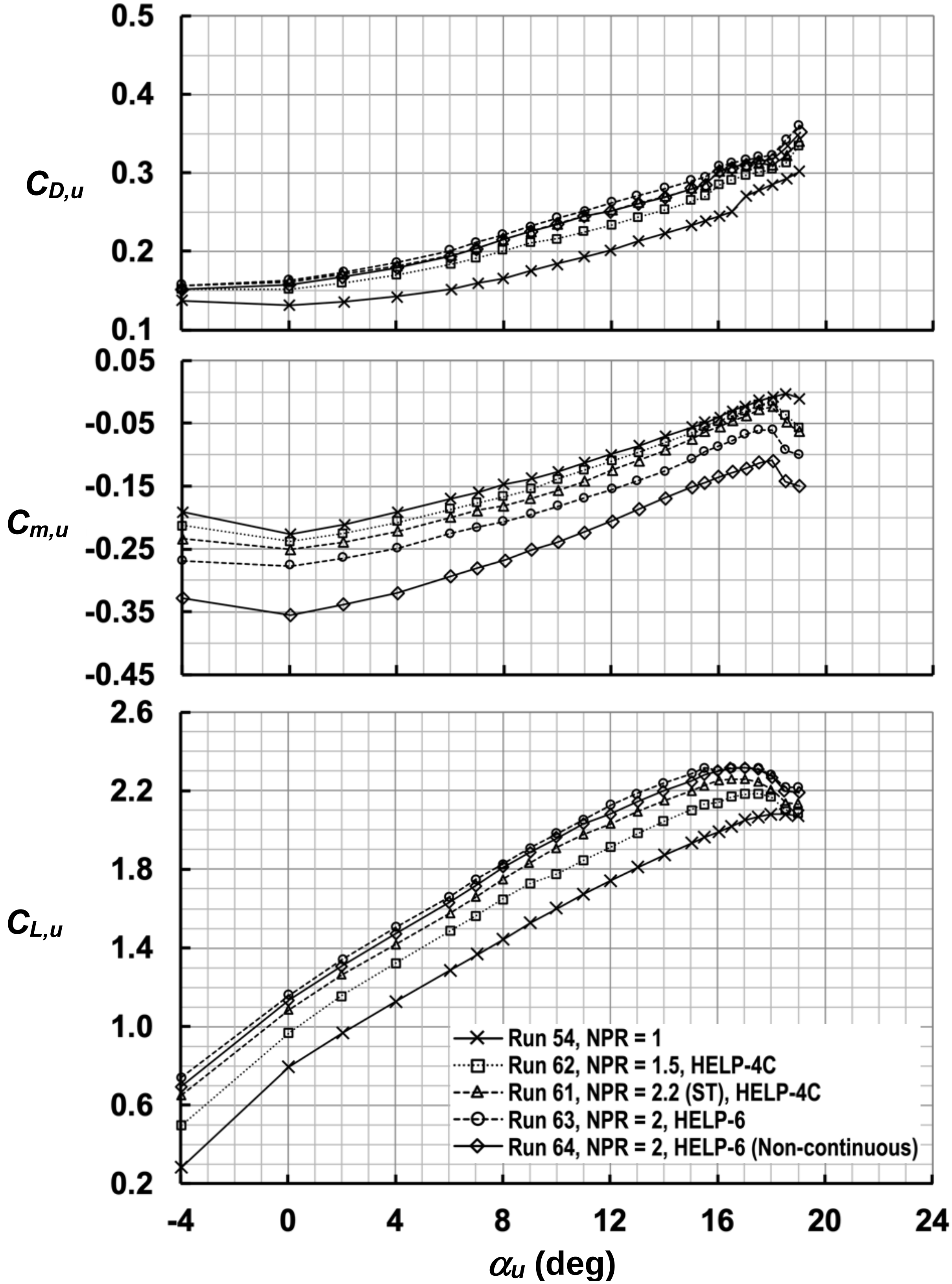


Figure D3. $C_{D,u}$, $C_{m,u}$ and $C_{L,u}$ vs. α_u plots for HELP actuators with 4- or 6-cartridge partial coverage (HELP-4C, HELP-6C; $M_{\infty,u}$ = 0.2, without TWICS).

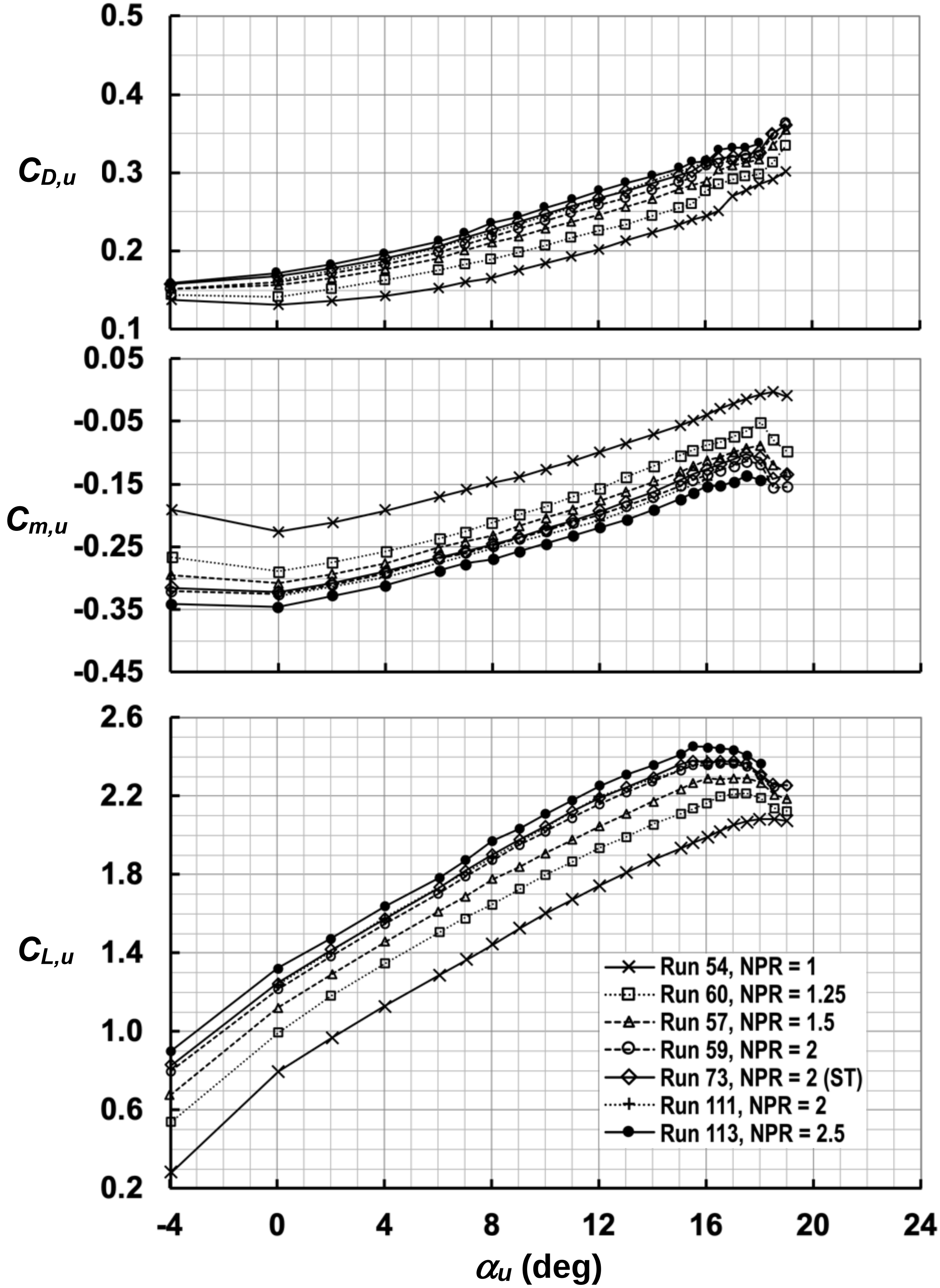


Figure D4. $C_{D,u}$, $C_{m,u}$ and $C_{L,u}$ vs. α_u plots for HELP actuators with 8-cartridge partial coverage (HELP-8C; $M_{\infty,u}$ = 0.2, without TWICS).

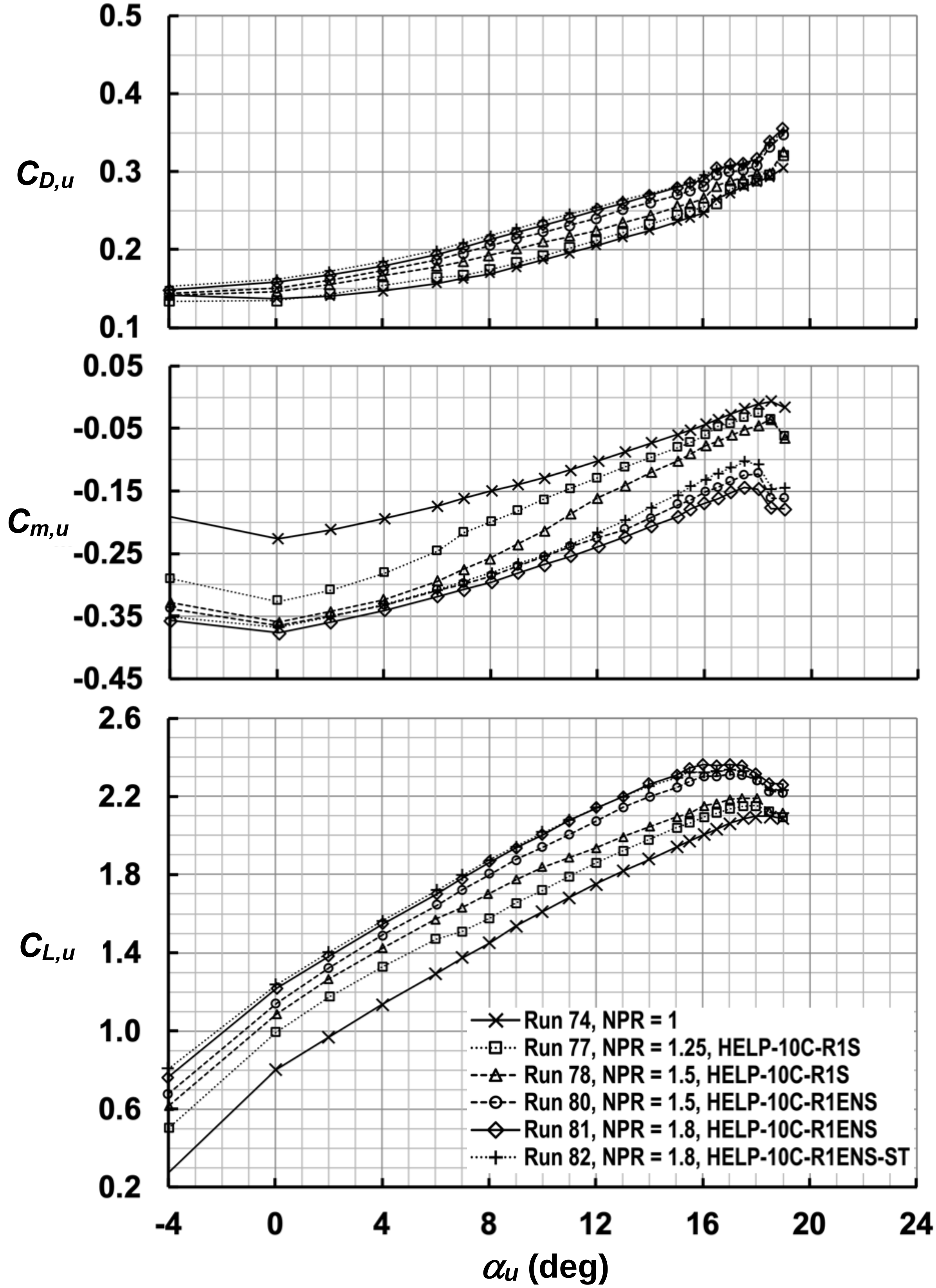


Figure D5. $C_{D,u}$, $C_{m,u}$ and $C_{L,u}$ vs. α_u plots for full-coverage HELP actuators Row 1 (sweeping jets) sealed (HELP-10C-R1S, HELP-10C-R1ENS; $M_{\infty,u}$ = 0.2, without TWICS).

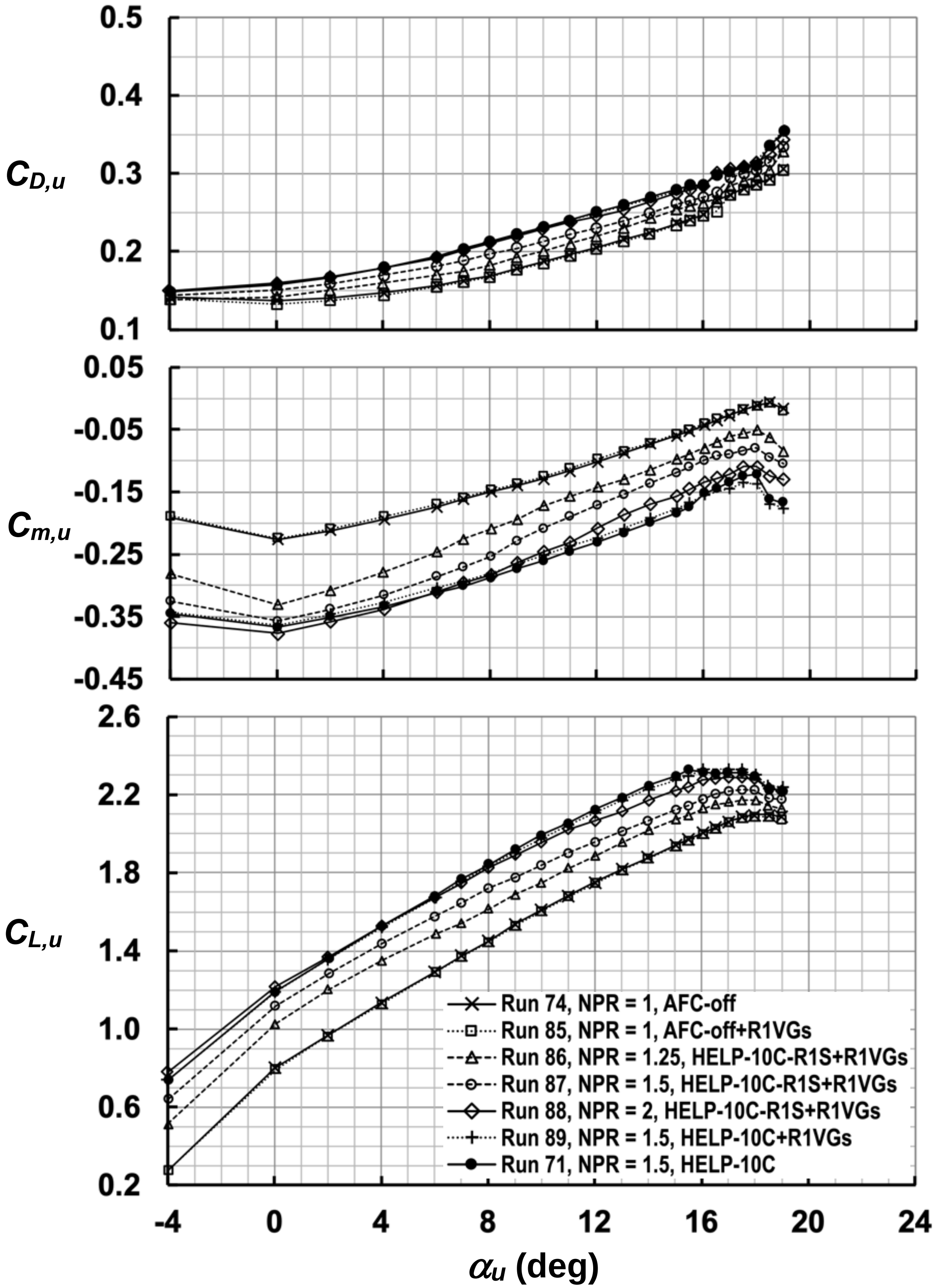


Figure D6. $C_{D,u}$, $C_{m,u}$ and $C_{L,u}$ vs. α_u plots for full-coverage HELP actuators with 79 VGs installed upstream of Row 1 sweeping jets (HELP-10C^-R1S+R1VGs, HELP-10C^-R1VGs; $M_{\infty,u}$ = 0.2, without TWICS).

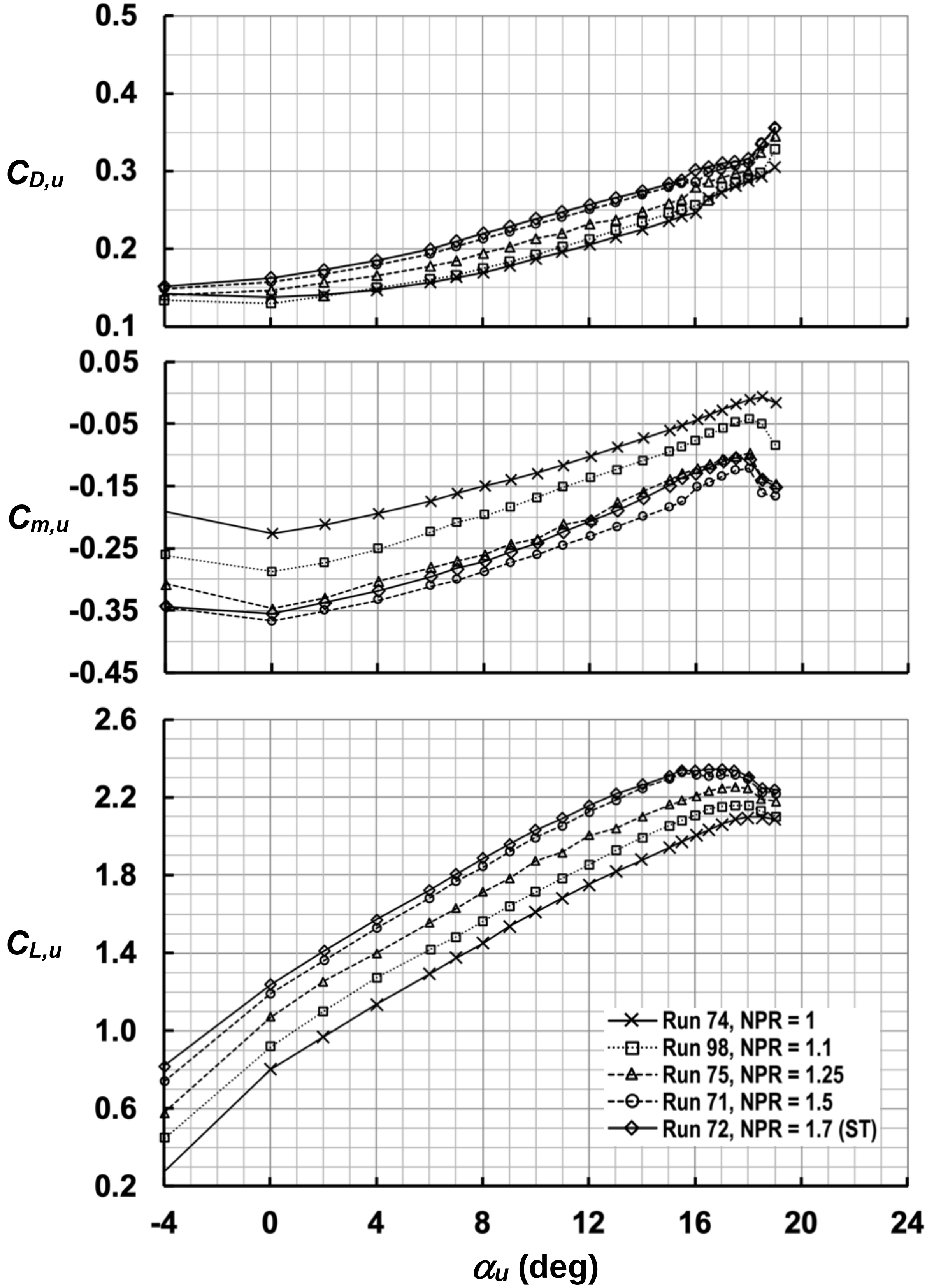


Figure D7. $C_{D,u}$, $C_{m,u}$ and $C_{L,u}$ vs. α_u plots for full-coverage HELP actuators (HELP-10C; NPR ≤ 1.7, $M_{\infty,u}$ = 0.2, without TWICS).

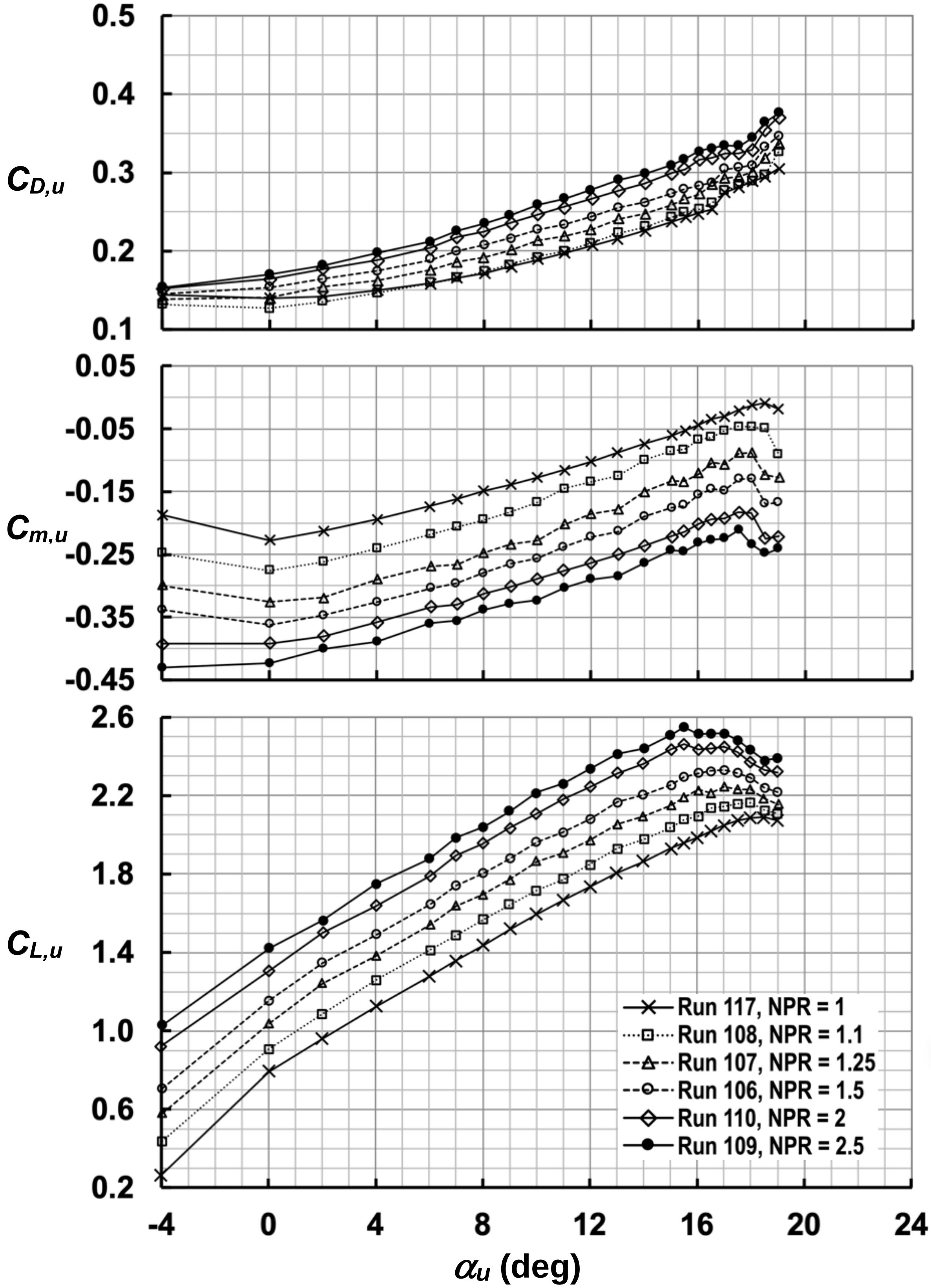


Figure D8. $C_{D,u}$, $C_{m,u}$ and $C_{L,u}$ vs. α_u plots for full-coverage HELP actuators (HELP-10C^; $M_{\infty,u} = 0.2$, without TWICS).

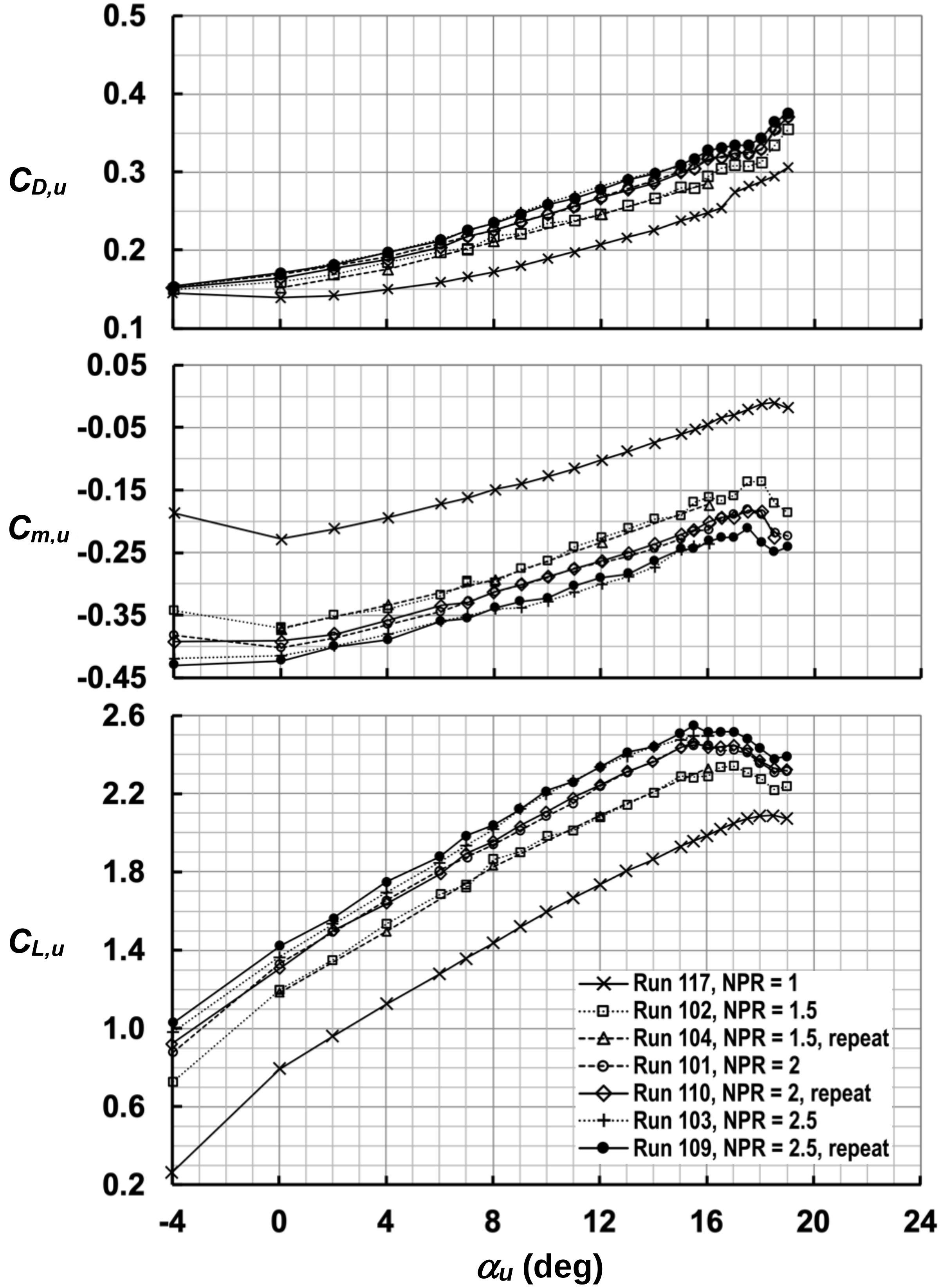


Figure D9. $C_{D,u}$, $C_{m,u}$ and $C_{L,u}$ vs. α_u plots for full-coverage HELP actuators, including repeat runs (HELP-10C^; $M_{\infty,u}$ = 0.2, without TWICS).

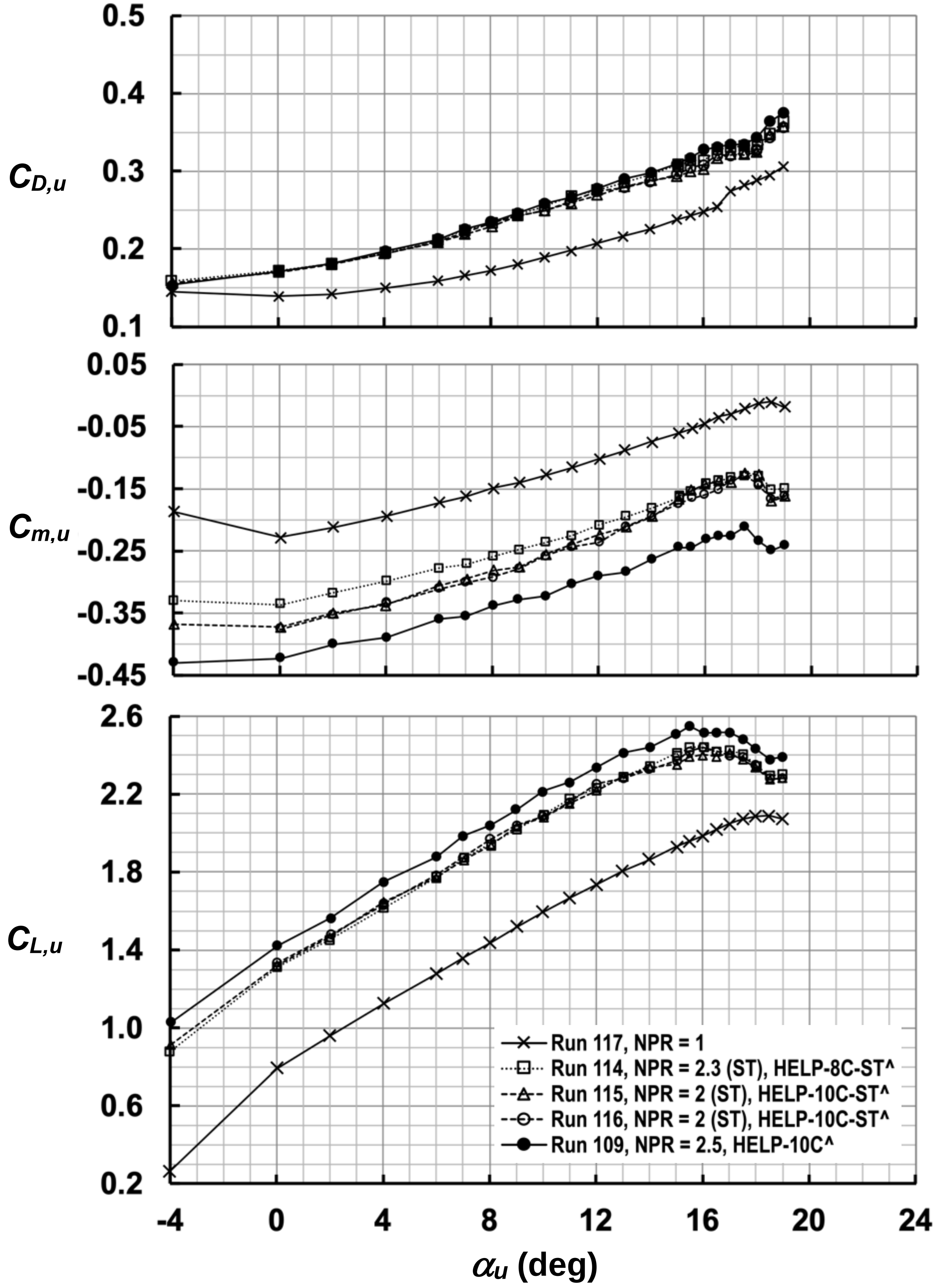


Figure D10. $C_{D,u}$, $C_{m,u}$ and $C_{L,u}$ vs. α_u plots for full- and partial- coverage HELP actuators at various spanwise tailoring NPR (HELP-10C-ST^, HELP-8C-ST^; $M_{\infty,u}$ = 0.2, without TWICS).

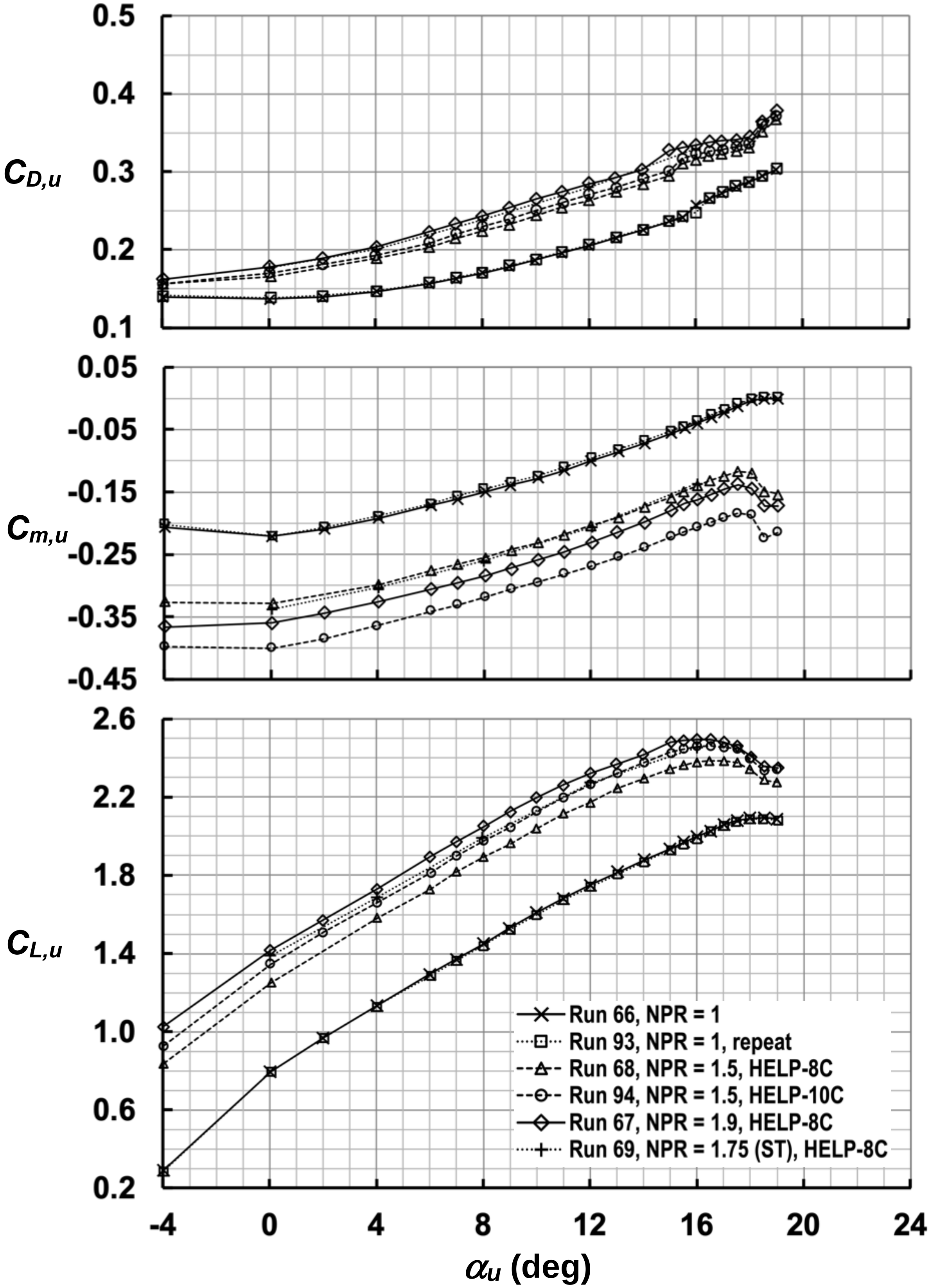


Figure D11. $C_{D,u}$, $C_{m,u}$ and $C_{L,u}$ vs. α_u plots for full- and partial-coverage HELP actuators at lower M_∞ (HELP-8C, HELP-10C; $M_{\infty,u}$ = 0.15, without TWICS).

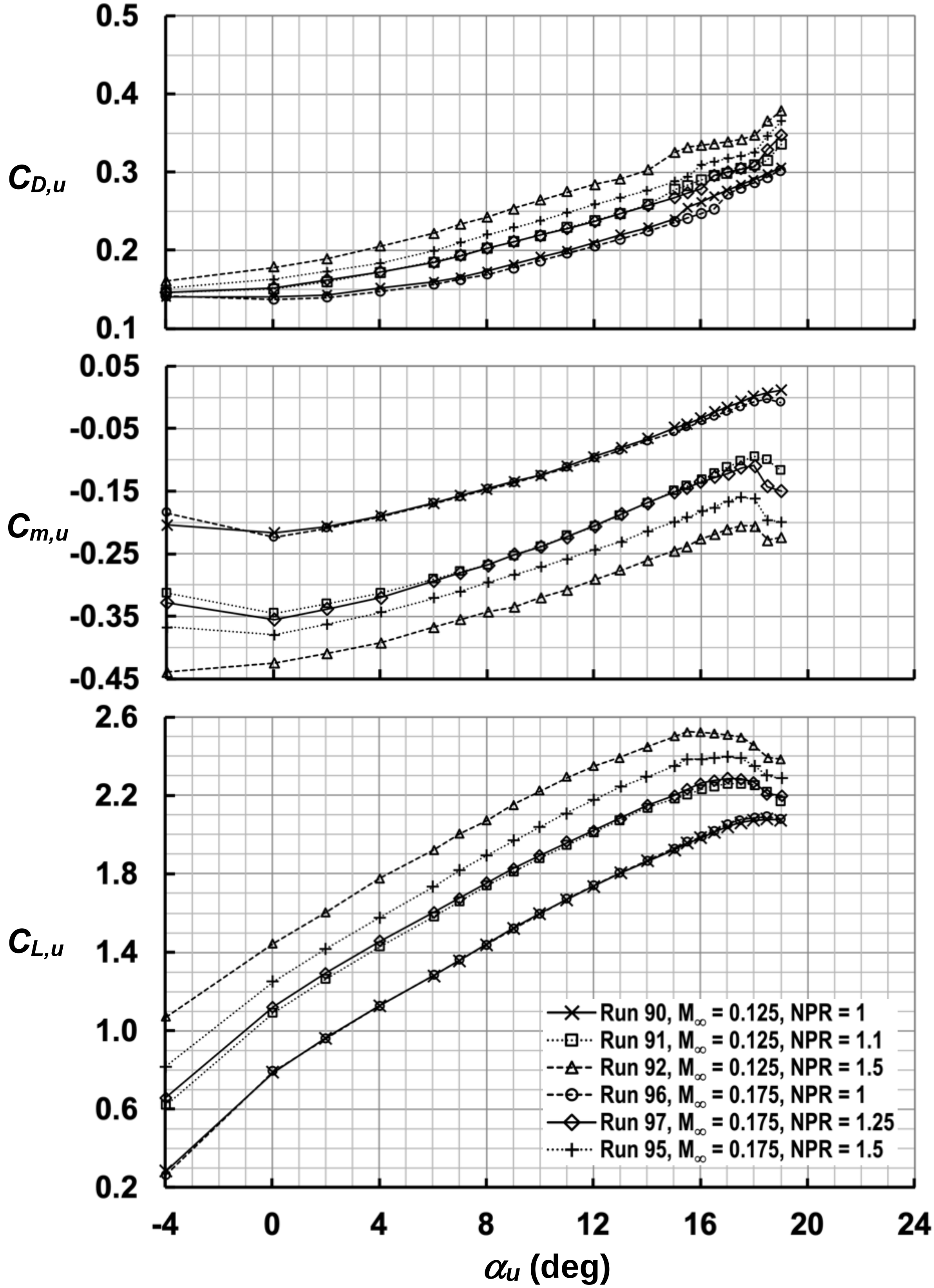


Figure D12. $C_{D,u}$, $C_{m,u}$ and $C_{L,u}$ vs. α_u plots for full-coverage HELP actuators at lower M_∞ (HELP-10C; $M_{\infty,u}$ = 0.125 and $M_{\infty,u}$ = 0.175, without TWICS).

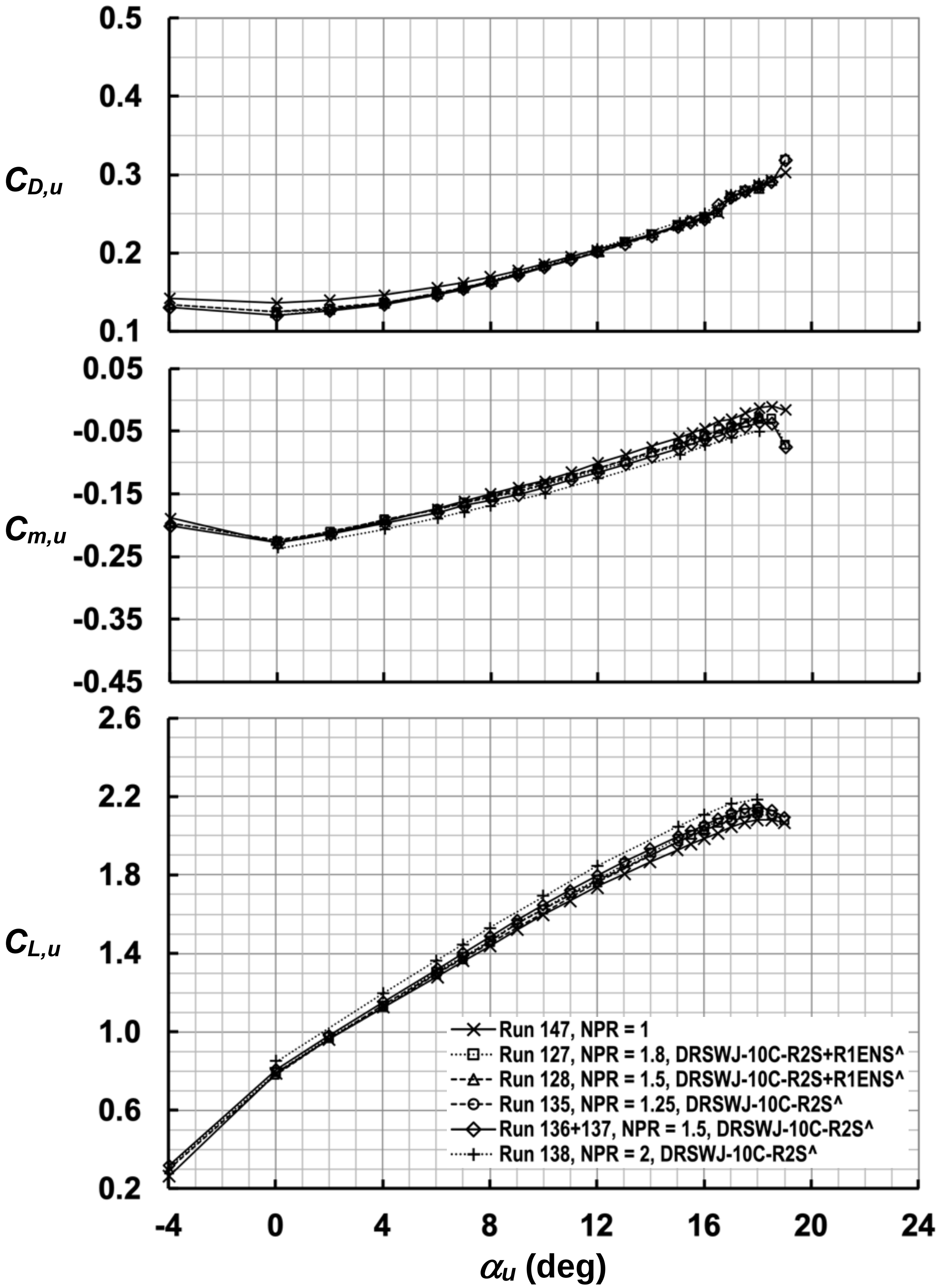


Figure D13. $C_{D,u}$, $C_{m,u}$ and $C_{L,u}$ vs. α_u plots for full-coverage DRSWJ actuators with various nozzle sealed (DRSWJ-10C-R2S+R1ENS^, DRSWJ-10C-R2S^; $M_{\infty,u}$ = 0.2, without TWICS).

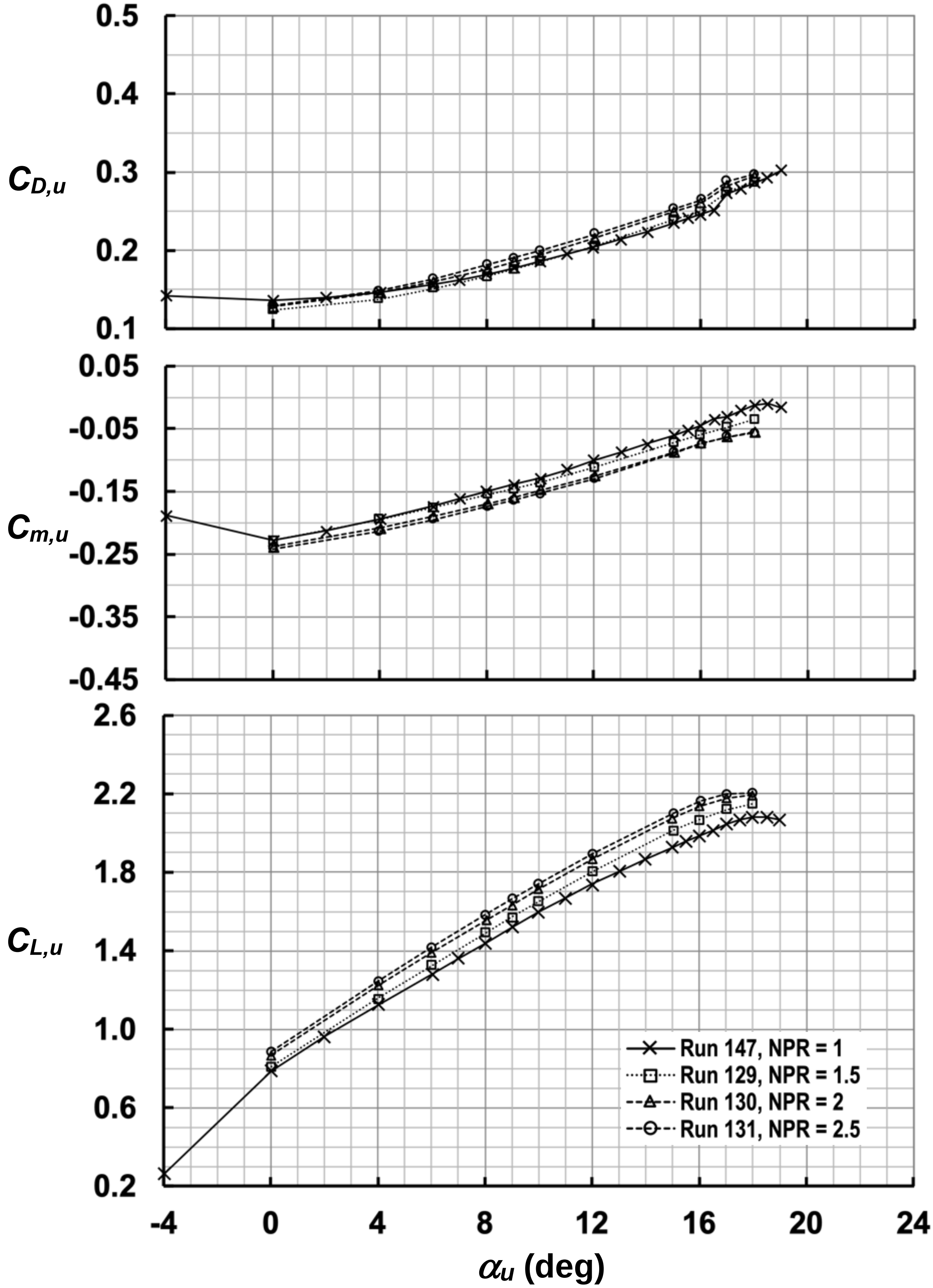


Figure D14. $C_{D,u}$, $C_{m,u}$ and $C_{L,u}$ vs. α_u plots for full-coverage DRSWJ actuators with all even nozzles sealed (DRSWJ-10C-ENS^; $M_{\infty,u}$ = 0.2, without TWICS).

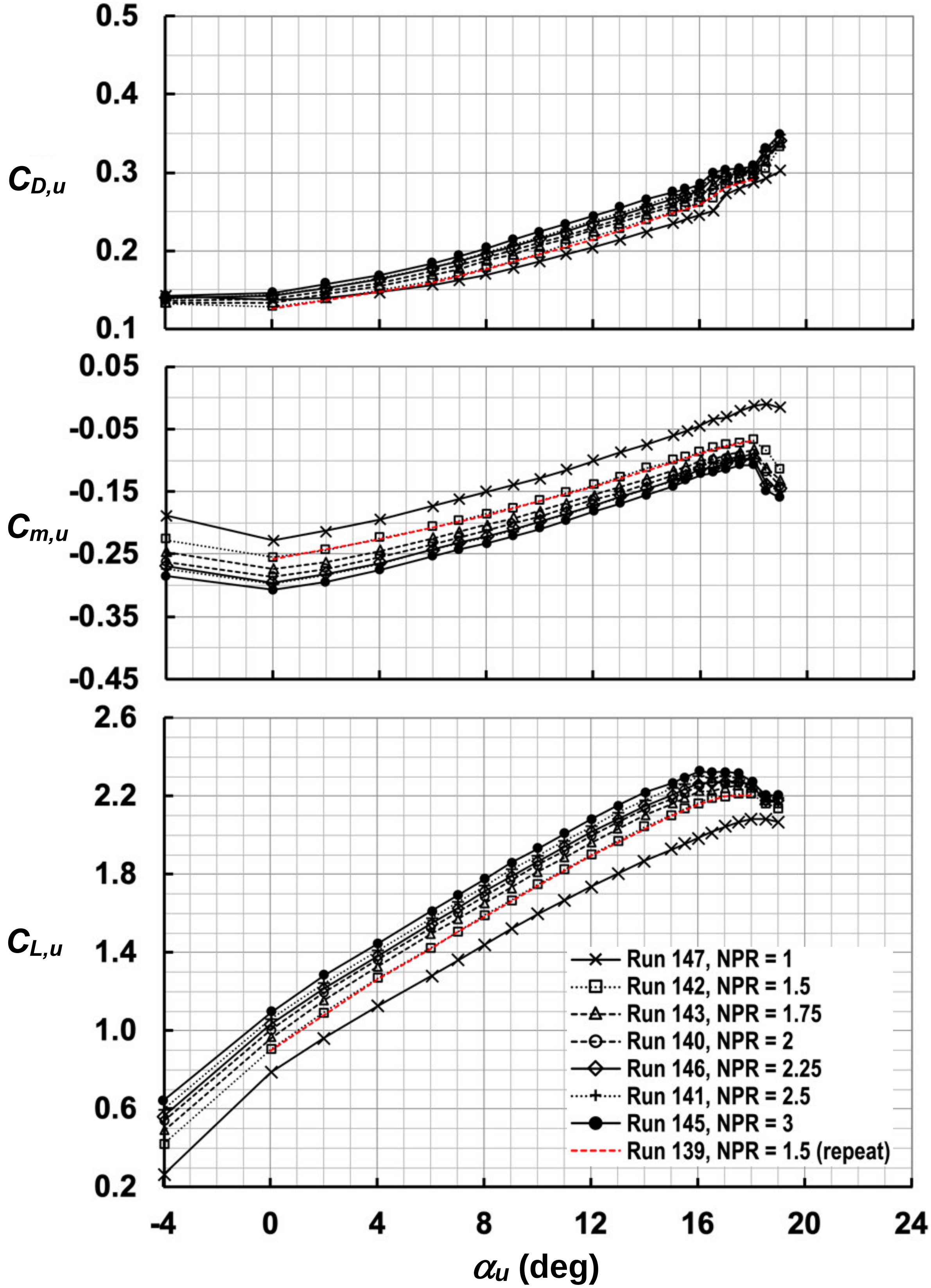


Figure D15. $C_{D,u}$, $C_{m,u}$ and $C_{L,u}$ vs. α_u plots for full-coverage DRSWJ actuators (DRSWJ-10C^; $M_{\infty,u}$ = 0.2, without TWICS).

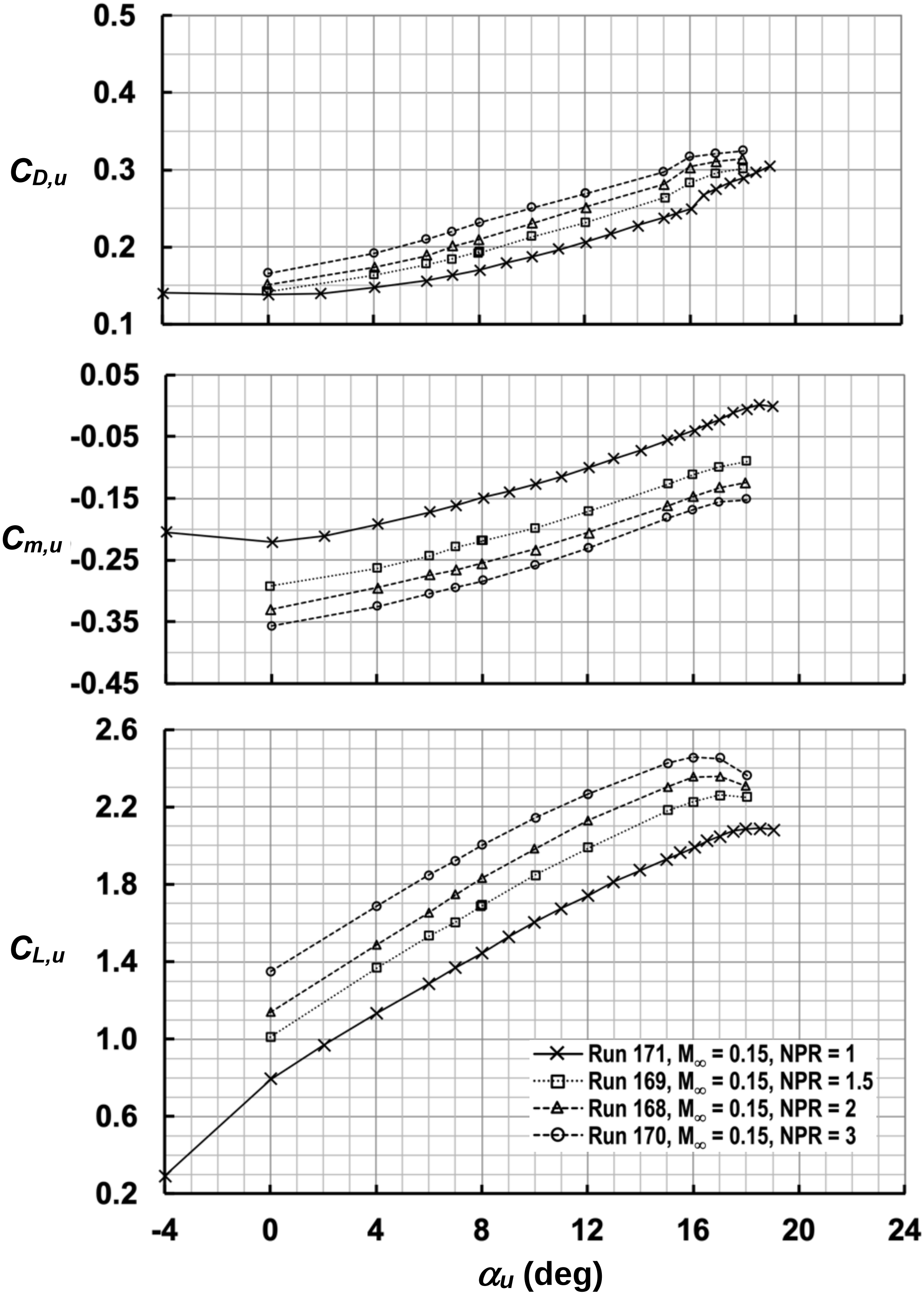


Figure D16. $C_{D,u}$, $C_{m,u}$ and $C_{L,u}$ vs. α_u plots for full-coverage DRSWJ actuators at lower M_∞ (DRSWJ-10C^; $M_{\infty,u}$ = 0.15, without TWICS).

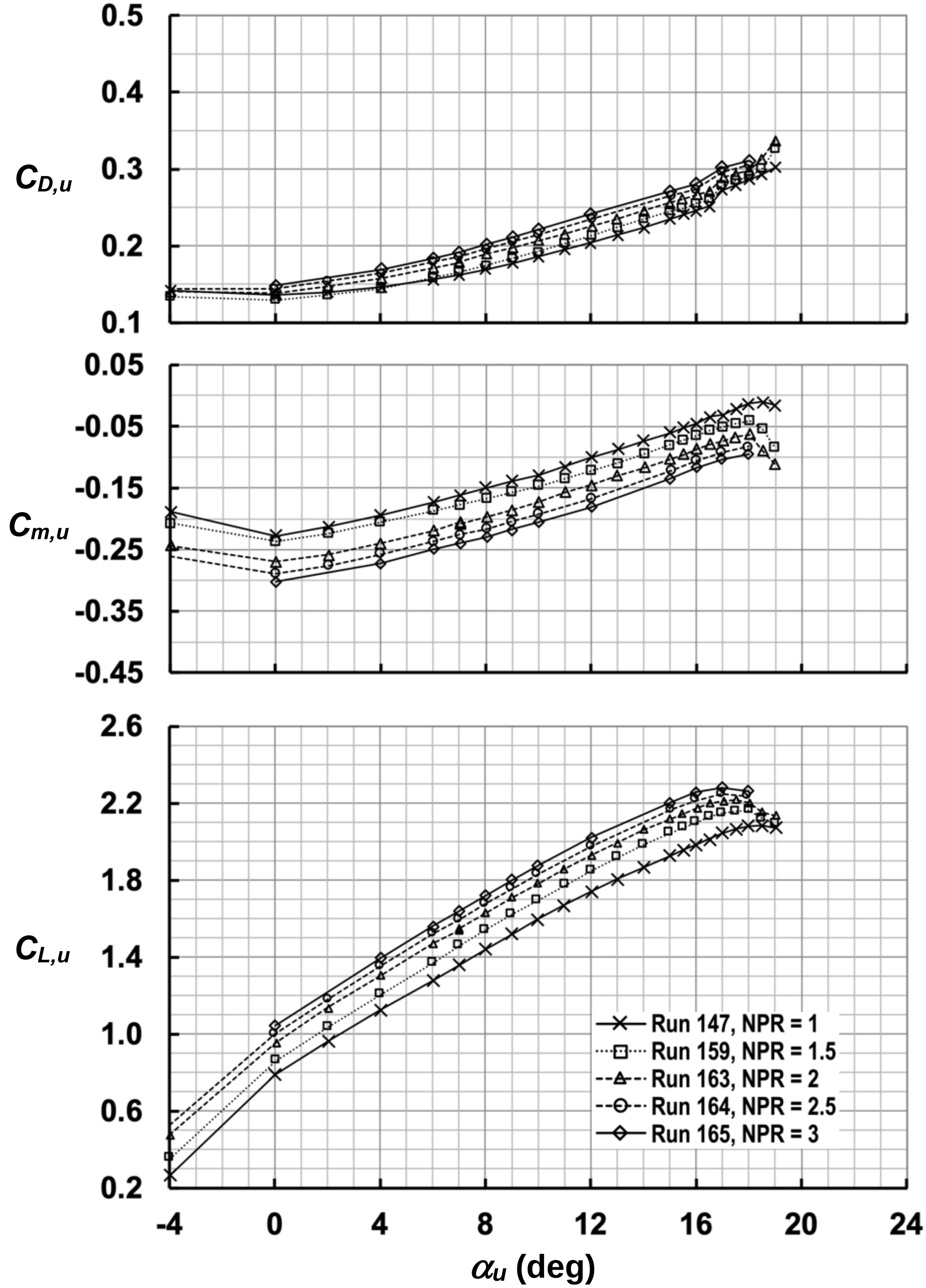


Figure D17. $C_{D,u}$, $C_{m,u}$ and $C_{L,u}$ vs. α_u plots for full-coverage APJ actuators (APJ-10C^; $M_{\infty,u}$ = 0.2, without TWICS).

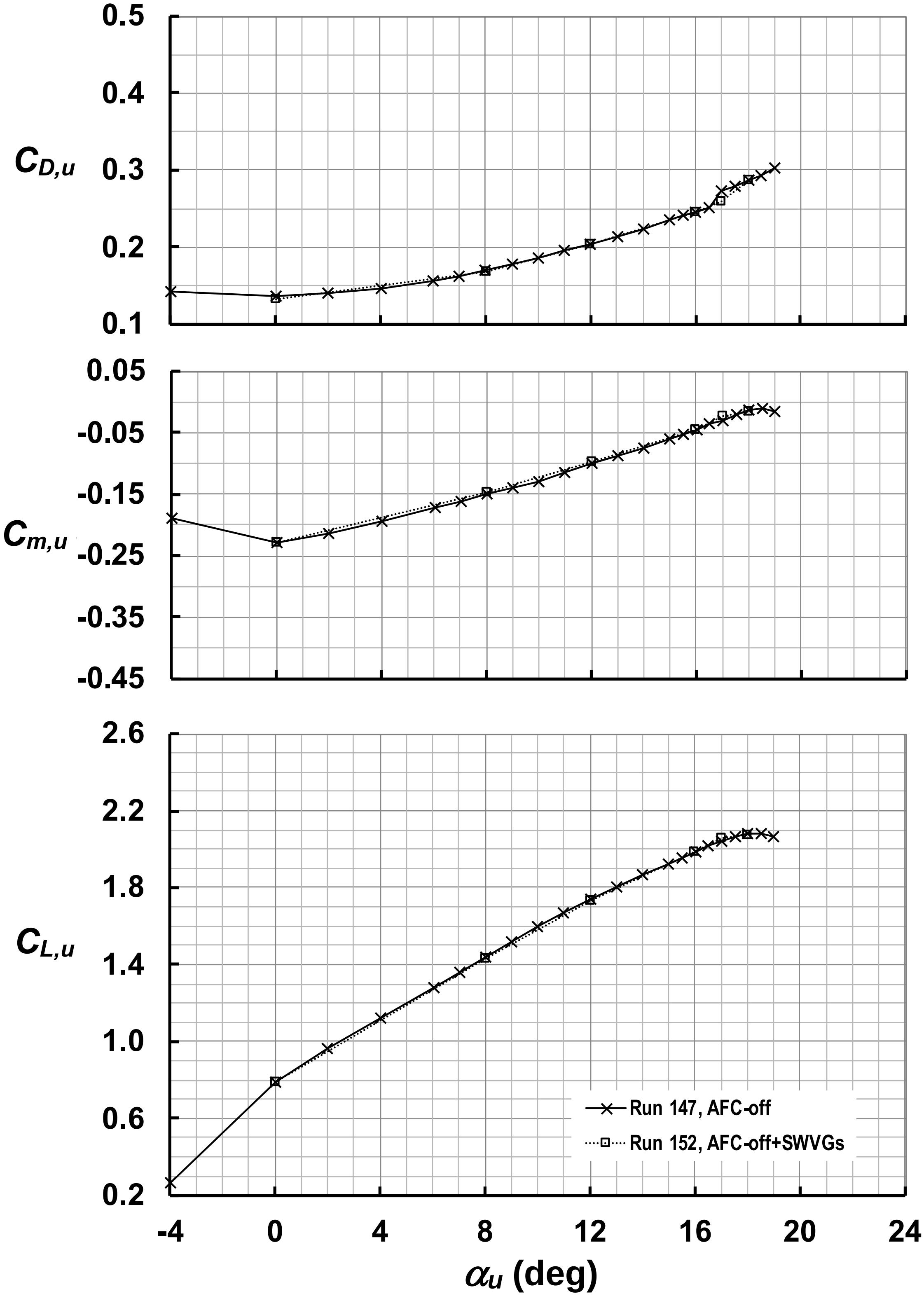


Figure D18. $C_{D,u}$, $C_{m,u}$ and $C_{L,u}$ vs. α_u plots for VGs installed downstream of pylon (AFC-off+SWVGs; NPR = 1, $M_{\infty,u}$ = 0.2, without TWICS).