
Nexø II checklist

Backup window #1: August 4th-5th 2018



Group 0: Long lead preparations

Group 0: Long lead preparations			
Step	√	Recipient	Action
0.1		Flight	Confirm dewar transport (T-14 days)
0.2		RSO	Contact AMC Malmö and confirm booking of ESD139 (T-7 days)

Group 1: Systems setup – 1 day before launch

Overview: Rocket is hoisted onto Sputnik, LOX dewar and gas bottles are loaded and secured on Sputnik. Also includes setup of Mission Control and telemetry systems.

Group 1: Systems setup (T-1 day)			
Step	√	Recipient	Action
1.1		Booster	Re-assemble rocket
1.2		RSO	Contact AMC Malmö and confirm booking of ESD139
1.3		Booster	Mount handling bar
1.4		Booster	Mount upper lift brackets
1.5		Booster	Secure rocket to transport rail
1.6		Booster	Install/confirm fin protection
1.7		Booster	Mount hoist bars on rocket transport rail
1.8		Booster	Mount H-frame onto mobile crane
1.9		Booster	Transfer rocket to Sputnik
1.10		LOX	Transfer two nitrogen bottles to Sputnik
1.11		LOX	Transfer LOX dewar to Sputnik
1.12		LOX	Secure LOX dewar and pressure bottles for departure
1.13		Pyro	Confirm spare igniters are on-board Sputnik
1.14		Recovery	Confirm that reefing timers are active

Group 2: Pressurization and Valve Check – 1 day before launch

Overview: Functionality check of pressurization system and all onboard valves. Validation of Nexø II onboard sensor outputs. DPR tank pressurized to 100 bar during checkout.

Group 2: Pressurization and Valve Check (T-1 day)			
Step	√	Recipient	Action
2.1		Announce	RF WARNING! Stay clear of rocket RF antennas!
2.2		PAD	Connect umbilical cable to rocket
2.3		Booster	Power up rocket avionics using Battery Charger Box
2.4		Booster	Confirm video transmitter is powered OFF
2.5		Data	Confirm rocket power-up and telemetry link established
2.6		Announce	RF warning cancelled. Rocket proximity is safe.
2.7		Booster	Confirm battery charging is in progress, powered by Sputnik
2.8		PAD	Confirm that land power is charging Sputnik batteries
2.9		Data	Confirm functionality of all pressure sensors
2.10		Data	Confirm functionality of all temperature sensors
2.11		Data	Confirm FUEL and LOX tanks pressureless
2.12		Data	Confirm LOX level sensor data output
2.13		Data	Set 5 bar venting pressure on both tanks; engage auto-venting
2.14		Data	FUEL and LOX main valves to closed position; confirm
2.15		Data	FUEL and LOX vent valves to closed position; confirm
2.16		Data	Disable automatic pressurization; both tanks, confirm
2.17		Data	Set target tank pressures to 3 barA, both tanks
2.18		Data	Report Helium tank pressure
2.19		LOX	Connect Helium compressor to rocket and check phases
2.20		LOX	Commence Helium loading; target pressure 100 bar
2.21		Data	Engage automatic pressurization of FUEL and LOX tanks
2.22		Data	Disable automatic pressurization; confirm
2.23		Announce	VENT WARNING! Stay clear of rocket vent ports!
2.24		PAD	Confirm rocket is clear for venting
2.25		Data	Pulse FUEL vent valve 3 times; Booster confirm operation
2.26		Data	Pulse LOX vent valve 3 times; Booster confirm operation
2.27		Data	Set 2 barA venting pressure on FUEL tank; Booster confirm
2.28		Data	Set 2 barA venting pressure on LOX tank; Booster confirm
2.29		Data	FUEL main valve to full open; Booster confirm operation
2.30		Data	LOX main valve to full open; Booster confirm operation
2.31		Data	FUEL and LOX main valves to closed position; confirm
2.32		Booster	Re-boot Engine Controller from Battery Charging Box
2.33		Data	Enable FUEL and LOX auto-venting at 15 barA, confirm
2.34		Announce	VENT warning cancelled. Rocket proximity is safe.
2.35		Data	Report Helium tank pressure

Group 3: Launch rail preparations – 1 day before launch

Overview: Nexø II is erected on launch rail. Jet vanes are mounted, DPR tank pressed to 350 bar, nitrogen purge system setup and test. Onboard video is tested. GNC is tested. Nexø II rain cover mounted for the night.

Group 3: Launch platform preparations (T-1 day)			
Step	v	Recipient	Action
3.1		Booster	Transfer rocket to Internal Power and remove umbilical cable
3.2		Data	Confirm Video transmitter is powered OFF
3.3		Booster	Remove lens covers from rocket cameras
3.4		Booster	Sputnik baskets to fully open position
3.5		Booster	Connect umbilical cable to rocket and start recharging batt.
3.6		Data	Confirm that battery charging has resumed
3.7		Booster	Transfer rocket to Sputnik vertical Launch Rail
3.8		Booster	Remove handling bar from rocket
3.9		Booster	Install Jet Vane Flange and connect wires
3.10		Booster	Install Launch Flange frame over the flame trench
3.11		Booster	Settle rocket to rest on rail stop
3.12		Booster	Connect umbilical safety line to Sputnik
3.13		Booster	Adjust Launch Flange height
3.14		Booster	Detach hoist and lifting brackets. Secure hoist for launch
3.15		Booster	Remove Meincke-step
3.16		Booster	Install and secure launch rail transport clamps
3.17		Booster	Connect Helium fill line to Rocket
3.18		LOX	Engage Helium compressor and pressurize to 350 bar
3.19		Booster	Install the Moisture Free 3000 in the LOX vent port
3.20		LOX	Test Moisture Free 3000; Booster confirm operation
3.21		Booster	Install Nitrogen Purge line on Launch Flange
3.22		LOX	Confirm Nitrogen purge bottle pressure above 60 bar
3.23		LOX	Confirm Nitrogen purge pressure at 40 bar
3.24		LOX	Confirm Moisture Free 3000 nitrogen pressure above 150 bar
3.25		Data	Pulse purge function; Booster confirm operation
3.26		Announce	RF WARNING! Stay clear of Rocket RF antennas!
3.27		PAD	Confirm Rocket is clear for onboard video test
3.28		Data	Power up video transmitter and perform video downlink tests
3.29		Data	Confirm Video transmitter is powered OFF
3.30		Announce	RF warning cancelled. Rocket proximity is safe.
3.31		GUIDO	Confirm GNC operational (move jet vanes)
3.32		GUIDO	Confirm if guidance system is using latest available firmware :-)
3.33		Booster	(SAT) Remove jet vane flange and store securely
3.34		FIDO	Confirm GPS lock on Rocket and FIDO operational
3.35		Booster	Transport FUEL and filling tank to Sputnik
3.36		LOX	Install LOX transfer pipe on Rocket

3.37	Data	Confirm Launch Platform Box heartbeat signal, PAD confirm
3.38	Data	Confirm Igniter circuit is software disarmed
3.39	PAD	Confirm Igniter circuit is hardware disarmed and shorted
3.40	Booster	Install pyro and connect ignition wires
3.41	PAD	Remove ignition short and insert bridge connector
3.42	Data	Confirm detection of igniter
3.43	PAD	Insert ignition short and remove bridge connector
3.44	Booster	Install launch flange splash cover
3.45	PAD	Confirm Rocket is charging from Sputnik and Sputnik from land
3.46	PAD	Confirm Rocket will be left powered overnight
3.47	Booster	Shut down TRX 1 + 2 telemetry from Charging Box
3.48	Booster	Fit rain cover over Rocket
3.49	Booster	Start up TRX 1 + 2 telemetry from Charging Box
3.50	Booster	Remove non-essential equipment from Sputnik
3.51	Booster	Top op Helium during evening (and night, if required)

Group 4: Pre departure preparations – T-7 hours

Overview: Morning preparations for departure. Validate DPR pressure and mount cover plates.

Group 4: Pre departure preparations - T-7 hours			
Step	√	Recipient	Action
4.1		RSO	(BEFORE 0500-UTC) Confirm launch to WS Malmö ATCC
4.2		Booster	Remove rain cover from rocket
4.3		PAD	Confirm that umbilical cable is attached to Rocket
4.4		Booster	Confirm rocket is powered and charging
4.5		LOX	Confirm telemetry link established on Sputnik LOX Monitor
4.6		Booster	Confirm Video transmitter is OFF on Battery Charge Box
4.7		PAD	Confirm DPR pressure above 260 bar on Sputnik LOX Monitor
4.8		LOX	Resupply Helium (if required) using Sputnik LOX Monitor
4.9		Booster	Remove Helium fill line
4.10		Booster	Mount DPR section shell plates
4.11		Booster	Activate internal camera light and nose cone tracker
4.12		LOX	Confirm Nitrogen purge bottle pressure above 40 bar
4.13		LOX	Confirm Moisture Free 3000 nitrogen pressure above 150 bar
4.14		Booster	Remove non-essential equipment from Sputnik
4.15		FIDO	Confirm GPS lock and signal from Nose Cone Tracker
4.16		Sputnik	Confirm Sputnik is ready for departure
4.17		Sputnik	Depart for ESD 139! :-)

Group 5: Enroute preparations – T-2 hours

Overview: Preparations during transit to ESD139. Onboard video and transmission test. Plane starts patrolling ESD139. Nexø II valve checkout.

Group 5: Enroute preparations (T-2 hours)			
Step	√	Recipient	Action
5.1		Announce	RF WARNING! Stay clear of Rocket RF antennas!
5.2		PAD	Confirm Rocket is clear for onboard video test
5.3		Data	Power up video transmitter and perform video downlink tests
5.4		Data	Confirm Video transmitter is powered OFF
5.5		Announce	RF warning cancelled. Rocket proximity is safe.
5.6		PAD	Conduct final rehearsal of flight plan with Booster and LOX
5.7		(Plane)	Start patrolling range; sweep for unauthorized vessels
5.8		Data	Confirm Sputnik/Bolette Munkholm network operational
5.9		Data	Confirm Bolette Munkholm/Nexø Tower network operational
5.10		Data	Confirm Launch Platform Box heartbeat signal, PAD confirm
5.11		Data	Verify functionality of all pressure sensors
5.12		Data	Verify functionality of all temperature sensors
5.13		PAD	Remove ignition short and insert bridge connector
5.14		Data	Confirm detection of igniter
5.15		PAD	Insert ignition short and remove bridge connector
5.16		Data	Set vent pressures for flight on both tanks; engage auto-venting
5.17		Data	FUEL and LOX main valves in closed position; confirm
5.18		Data	FUEL and LOX vent valves in closed position; confirm
5.19		Stream	Confirm stream is running
5.20		Sputnik	Confirm when arrived at launch position

Group 6: Fuel loading – T-30 min

Overview: Load fuel onto Nexø II. Continuous plane patrol of area.

Group 6: Fuel loading (T-30 min)			
Step	v	Recipient	Action
6.1		PAD	Remove splash cover from Launch Flange
6.2		PAD	Release and remove launch rail transport clamps
6.3		Booster	Enable Nosecone tracking transmitter
6.4		Booster	Install LOX insulation on Rocket
6.5		PAD	Sputnik baskets to fully open position. Confirm
6.6		GUIDO	Confirm GNC operational (move jet vanes)
6.7		FIDO	Confirm GPS lock on Rocket and FIDO operational
6.8		White RIB	Verify Nosecone tracking transmitter signal
6.9		PAD	Confirm readiness to begin Fuel loading.
6.10		Data	Open FUEL vent valve
6.11		PAD	Load FUEL; confirm when complete
6.12		Data	Close FUEL vent valve
6.13		LOX	Re-establish Moisture Free 3000 gas line and re-adjust flow
6.14		Data	Set Engine Controller flight parameters
6.15		Blue RIB	Blue RIB to PAX any non-CS personnel to Bolette Munkholm
6.16		PAD	Confirm readiness to begin LOX loading.

Group 7: LOX loading and launch

Overview: LOX loading, personel evacuation and launch.

Group 7: LOX loading and launch			
Step	√	Recipient	Action
7.1		RSO	Contact WS Malmö ATCC and announce T-30 minutes
7.2		PAD	Start all low speed cameras; confirm when completed
7.3		Stream	Confirm stream is running
7.4		Blue RIB	Blue RIB to Sputnik, standby for evacuating Sputnik
7.5		DSC RIB	DSC RIB to Sputnik, standby for evacuating Sputnik
7.6		PAD	Activate Moisture Free 3000
7.7		PAD	Check rail is clear and baskets are in outer position
7.8		RSO	Monitor Range continuously (Radar and plane)
7.9		Announce	Range is clear. Initiating final launch preparations.
7.10		Recovery	Broadcast expected landing area
7.11		Data	Confirm data logging running
7.12		PAD	Start all High speed cameras; confirm when completed
7.13		Data	Open LOX vent valve
7.14		PAD	Begin LOX loading process; confirm LOX target quantity
7.15		(Plane)	Aerial Video to launch positions and altitudes; confirm
7.16		Data	Video transmitter to low power mode, verify camera feed
7.17		Announce	LOX tank full, stop transfer
7.18		PAD	Video and Photo board blue RIB -> move to launch position
7.19		PAD	Sputnik crew board DSC RIB and standby
7.20		LOX	Top up LOX to target level
7.21		LOX	LOX tank full, stop and detach fill line
7.22		PAD	Evacuate Sputnik! PAD confirm all personel evacuated.
7.23		PAD	Insert igniter bridge connector
7.24		PAD	Remove igniter short and confirm when at safe distance
7.25		Data	Confirm that igniter is software armed
7.26		Guido	Arm GNC
7.27		Data	Video transmitters to high power; confirm
7.28		Announce	Stand by for final GO/NO-GO call; launch is imminent
7.29		RSO	Range Safety Officer?
7.30		DSC RIB	DSC RIB?
7.31		Blue RIB	Blue RIB?
7.32		FIDO	FIDO?
7.33		GUIDO	GUIDO?
7.34		Data	Data?
7.35		Announce	We are GO for LAUNCH!
7.36		Data	Autosequence Start; 30 second countdown
7.37		Announce	(Flight) 10-9-8-7-6-5-4-3-2-1-Ignition!

Group 8: Recovery

Overview: Recover rocket and nose cone. Rocket is tracked through FIDO. Nose cone is tracked with dedicated tracking device. Recovered rocket is rinsed with clean water.

Group 8: Recovery			
Step	√	Recipient	Action
8.1		DSC RIB	Return Booster, LOX, PAD and Crew to Sputnik
8.2		(Plane)	Attempt to re-acquire Rocket and track splash-down location
8.3		Blue RIB	Move to splash-down location and start recovery operations
8.4		Bolette	Move to splash-down location and start recovery operations
8.5		PAD	Sputnik boarded: Damage assesment; returning to Nexø
8.6		DSC RIB	Track Nose Cone Splash-down location and recover
8.7		Event	Rocket is located, nose cone is located
8.8		RSO	Contact Malmö ATC, release air space
8.9		Announce	RF WARNING! Stay clear of Rocket RF antennas!
8.10		Event	Rocket is recovered, video antennas wapped in tin foil
8.11		DSC RIB	PAX PAD crew to Bolette Munkholm
8.12		PAD	PAD remove Avionics Bay shell plates and disconnect batteries
8.13		Announce	RF warning cancelled. Rocket proximity is safe.
8.14		PAD	Booster and PAD start purging sea water from Rocket
8.15		Announce	CS fleet head for Spaceport Nexø

Group 9: LOX top off due to range safety delays

Group 9: LOX top off due to range safety delays			
Step	v	Recipient	Action
9.1		PAD	Insert igniter short
9.2		PAD	Remove igniter bridge connector
9.3		Booster	Reconnect LOX fill line
9.4		Photo	Reset cameras
9.5		Flight	Resume from 7.1

Group 10: Launch scrub due to range safety violations etc.

Group 10: Launch scrub due to range safety violations etc.			
Step	v	Recipient	Action
10.1		PAD	Insert igniter short
10.2		PAD	Remove igniter bridge connector
10.3		Booster	Reconnect LOX fill line
10.4		LOX	Drain LOX tank through LOX fill line
10.5		Booster	Remove LOX tank isolation
10.6		Booster	Install launch rail transport clamps
10.7		Booster	Install splash cover on launch flange
10.8		Data	Open fuel vent valve
10.9		Booster	Drain fuel tank
10.10		Data	Close fuel vent valve

Group 11: Engine shutdown during pre-stage

Group 11: Engine shutdown during pre-stage			
Step	v	Recipient	Action
11.1		Data	Purge engine
11.2		PAD	Insert igniter short
11.3		PAD	Remove igniter bridge connector
11.4		Booster	Reconnect umbilical
11.5		Booster	Power cycle/restart EMC
11.6		Booster	Inspect jet vanes and motor
11.7		Data	Report DPR pressure
11.8		All	Go/No-Go for 2nd attempt - if No goto 10.3
11.9		Data	Confirm LPB heartbeat signal, PAD confirm
11.10		Data	Confirm igniter is software disarmed
11.11		PAD	Confirm igniter is hardware disarmed and shorted
11.12		Booster	Install igniter and connect
11.13		PAD	Remove ignition short and insert bridge connector
11.14		Data	Confirm detection of igniter
11.15		PAD	Insert ignition short and remove bridge connector
11.16		Data	Open fuel vent valve
11.17		Booster	Drain fuel tank
11.18		Data	Close fuel vent valve
11.19		Booster	Reconnect LOX fill line
11.20		Flight	Resume from 6.5

Callsign designations

Callsign	Recipient	Craft/location/station (role) description	Location
Announce	All CS personnel	General announcement to all personnel	-
Blue RIB	Crew of Blue RIB	Blue RIB is the fastest craft in the CS Fleet. (PAX transfer, recovery, range safety)	Blue RIB
Bolette Munkholm	Crew of Bolette Munkholm	Bolette Munkholm is the CS Fleet Flagship (Mission Control, Radar, communications hub)	Bolette Munkholm
Booster	Part of PAD Crew	The Booster crew is primarily responsible for all mechanical ground and flight hardware on Sputnik	Sputnik
CS RIB	Crew of CS RIB	CS RIB is the smallest craft of the CS Fleet (PAX transfer, quick response service craft)	CS RIB
Data	Part of Mission Control Crew	Command & Control of ground and flight electronic hardware; network and communications expert	Bolette Munkholm
DSC RIB	Crew of DSC RIB	DSC RIB is the biggest fast craft in the CS Fleet (large PAX transfer, recovery, range safety)	DSC RIB
FIDO	Part of Mission Control Crew	Rocket and Fleet telemetry monitoring, splash-down prediction and Fleet coordination	Bolette Munkholm
Flight	Launch Campaign Lead	Flight oversees all coordination and is overall responsible for the launch campaign	Bolette Munkholm
GUIDO	Part of Mission Control Crew	Monitoring, calibration and adjustment of the Active Guidance System of the rocket	Bolette Munkholm
LOX	Part of PAD Crew	LOX is primarily responsible for handling liquid oxidizer, pressure vessels and other gasses	Sputnik
PAD	Launch Pad Lead	PAD is primarily responsible for coordinating and monitoring all Launch Pad operations	Sputnik
Photo	Still picture and recorded video Lead	Photo (Alpha) coordinates all still picture efforts and all stationary recorded video efforts	Sputnik
Plane	Crew of Airplane	"Plane" is a fixed wing aircraft designation (aerial recon, range safety, recorded video)	ESD 139 airspace
Pyro	Licensed pyrotechnician	Pyro is responsible for supervising all activities related to the pyrotechnic igniter device	Sputnik
Recovery	(see Blue RIB)	Recovery is the alternate designation for Blue RIB, when fully focused on fast search and recovery	Blue RIB
RSO	Part of Mission Control Crew	RSO is responsible for coordinating external communications, local Air Traffic Control, Radar ops.	Bolette Munkholm
Sputnik	Crew of MLP Sputnik	Mobile Launch Platform Sputnik is the CS katamaran Launch vessel	Sputnik
Stream	Live Stream Lead	Stream manages and executes the live stream footage from the CS Fleet	OB1 (CPH)
Video	Video footage Lead	Video (Alpha) coordinates and executes all high quality on-site video documentation efforts	Sputnik