CDNS UAV PLATFORMS · AIR

GOOSE CS-110

THE UNPOWERED PNEUMATIC INTERCEPTOR ROUND

An unpowered round with nothing aboard to power, receive or arm, thrown by air at 189.2 m/s and built for magazine depth.

1.600 kg	**189.2 m/s**	**28.64 kJ**	**Ø90 mm**	**1,159 g**
ALL-UP MASS	AT THE MUZZLE	LAUNCH ENERGY	BORE, 30 BAR OVER 3.00 M	PEAK LAUNCH SHOCK, 608 G MEAN

AT A GLANCE

A ROUND SIZED FOR THE MAGAZINE. NOT FOR THE SINGLE EXQUISITE SHOT.

Goose CS-110 is a steel nose on four moulded parts, with nothing aboard to charge, program or arm. The figures below size it; the cards say why a buyer holding ground against numbers would choose it.

NOTHING ABOARD

NO BATTERY, NO RECEIVER, NO INITIATOR

The round carries no electrical system and no energetic material. The launcher holds the energy, and from the muzzle onward the round spends none of its own.

THE STEEL IS THE EFFECT

MOST OF THE MASS IS THE NOSE

With no pack, controller or harness to carry, the mass goes to the nose. Off a 10° quadrant elevation the round arrives at 120.6 m/s carrying 11.7 kJ.

BUILT FOR DEPTH

MOULDED AIRFRAME, TURNED STEEL NOSE

Every moulded part comes off tooling cut in-house, and the nose is plain turned bar. Depth of fire is bought with moulds and throughput rather than with a more complex round.

ONE INTERFACE

A KINETIC NOSE OR A CAPTURE NOSE

Both heads mount to one mechanical nose interface, and the launcher delivers the same stroke to either. The choice of effect is made at the breech.

IN THIS SHEET

01 · SPECIFICATION

EVERY FIGURE THE DESIGN CLOSES. EACH BESIDE THE BASIS IT RESTS ON.

The specification of Goose CS-110 grouped the way an engineer reads it: the round and its mass, geometry, stability, the launch, structure, flight, materials, the launch interface and handling.

01 THE ROUND AND ITS MASS

PARAMETER	VALUE	BASIS
All-up mass	1.600 kg	design value; the mass the launch and the stability are sized to
Construction	A steel nose and four moulded parts	the tail boom and the six fins are bonded with a two-part structural epoxy
Electrical system	None	no battery, motor, receiver, servo, sensor, indicator or initiator, and no wiring harness
Energetic material	None	no warhead, fuze, primer, propellant or initiator

02 GEOMETRY

PARAMETER	VALUE	BASIS
Bore and obturator diameter	Ø90.00 mm	design value; the one fixed dimension
Bore area	63.617 cm²	calculated, $\pi D^2/4$
Main body diameter	Ø70.00 mm	calculated; set by the stability solve
Tail boom diameter	Ø32.00 mm	calculated; set by the fin span
Fins	Six, fixed, equispaced	calculated; four do not close the stability solve and eight are over-stable
Moving surfaces	None	no trim mechanism on the round; the launcher aims and the round flies ballistic

03 STABILITY

PARAMETER	VALUE	BASIS
Static margin	Inside the 1.5 to 2.5 calibre design band	calculated; subsonic slender-body method at M 0.55
Fin flutter speed	2,778 m/s	calculated; 14.7 times the muzzle velocity

04 THE LAUNCH

PARAMETER	VALUE	BASIS
Charge pressure	30.0 bar	design launch case, shop-air class
Stroke	3.00 m	design launch case

PARAMETER	VALUE	BASIS
Accumulator volume per shot	15.9 L	calculated; isentropic expansion with the gas-inertia correction
Muzzle velocity	189.2 m/s	design value; the interior-ballistics model closes on it at 30 bar over 3.00 m
Launch energy	28.64 kJ	calculated, ½mv² at 1.600 kg
Combined energy efficiency	85.9 %	calculated from five named losses against the ideal expansion
Largest single loss	Gas inertia, 5.2 %	calculated; the charge air is accelerated with the round

05 LAUNCH SHOCK AND STRUCTURE

PARAMETER	VALUE	BASIS
Peak acceleration	11,369 m/s², 1,159 g	calculated at x = 0, t = 0.14 ms, before the round moves
Mean acceleration	5,966 m/s², 608 g	calculated, v²/2S over the stroke
Peak to mean	1.91	calculated
Peak base force	18,191 N	calculated; the design load for every part
Structural safety factor	2.0	design value, on strength and on shell buckling
Moulded wall	2.50 mm	calculated; buckling governs at 2.14 mm against 1.19 mm on strength
Fin root, bending	7.5 MPa against 110 MPa	calculated; margin of safety +13.7

06 FLIGHT AND EFFECT

PARAMETER	VALUE	BASIS
Guidance	Tier 1, preset	the launcher sets the laying solution; nothing aboard receives
Drag coefficient	0.35	handbook value for a blunt-nosed finned cylinder, on the Ø70 reference
Range at 10° quadrant elevation	894 m	calculated; point mass, ISA sea level, drag coefficient 0.35
Range at 45° quadrant elevation	1,636 m	calculated; point mass, ISA sea level, drag coefficient 0.35
Impact at 10°	120.6 m/s, 11.7 kJ	calculated on the same trajectory basis
Impact at 45°	99.7 m/s, 8.0 kJ	calculated on the same trajectory basis
Effect at the target	Collision	the steel nose is the effect; the airframe carries it

07 MATERIALS

PARAMETER	VALUE	BASIS
Nose	Alloy steel, AISI 4140 class, normalized	a mass item chosen for density; 7,850 kg/m³, handbook value
Body, boom, fins and cup	Glass-filled polyamide, PA66-GF33	110 MPa and 7.0 GPa conditioned at 50 % RH, handbook values; 1,400 kg/m³
Obturating land	Thermoplastic polyurethane or filled PTFE	the sealing face against the bore
Bonds	Two-part structural epoxy	lap shear 20–30 MPa, handbook value

08 LAUNCH INTERFACE AND SAFETY FUNCTIONS

PARAMETER	VALUE	BASIS
Cue	Bearing, range and height	over a wire from the fire-control interface, or entered by hand
Laying solution	Point mass, computed at the launcher	checked against the mount envelope before the mount moves
Mount envelope	±170° azimuth, −3° to +75° elevation	the launch platform's travel; a solution outside it is refused
Breech valve	Normally closed, opens in under 5 ms	with no power on the coil the breech is shut
Arming	A person turns the arm key for every shot	four permissives in series ahead of the arm relay
Partner fire-control cue	A permissive only	it cannot bypass the interlock chain or the arm action
Fire path	No automated or remote-only fire path	a human arm action is mandatory for every shot

09 HANDLING AND STORAGE

PARAMETER	VALUE	BASIS
Stored state	Inert	no propellant, primer or initiator to store
Magazine and indexer	No pyrotechnics	the launch energy is compressed air held at the launcher
Handling	Dense steel nose	crush and dropped-object precautions apply
To the line	Round storage rack	the storage configuration of the launch platform carries rounds to the launcher

02 · THE ROUND

A STEEL NOSE ON A MOULDED AIRFRAME. NOTHING ABOARD TO POWER OR ARM.

Goose CS-110 is a pneumatically launched, fully unpowered round that defeats a small uncrewed aircraft by collision. It leaves a ground tube on shop air and flies a ballistic arc on six fixed fins.

The round is a solid alloy-steel nose carried on a moulded glass-filled nylon airframe: a Ø70 body shell, a Ø32 tail boom, six fixed fins and an obturator cup that takes full bore pressure. It weighs **1.600 kg**. The mass budget works back from that figure: the structure takes what buckling and stability demand, and the rest goes to the nose, where mass does useful work. The airframe is a carrier and the steel is the effect.

The short list of what the round leaves out is the design. It carries no battery, no motor, no receiver, no servo, no sensor, no indicator and no initiator, and so it has no wiring harness. It carries no warhead, no fuze, no primer, no propellant and no energetic material. The launcher holds the energy, lays the shot and throws the round; from the muzzle onward the round is on its own and asks for nothing.

1.600 kg
ALL-UP MASS

5
PARTS: A STEEL NOSE AND FOUR MOULDED PARTS

6
FIXED FINS, NO MOVING SURFACE

0
BATTERIES, RECEIVERS, SENSORS OR INITIATORS ABOARD

03 · THE REQUIREMENTS

EIGHT THINGS THE SYSTEM MUST DO. THE ROUND ANSWERS EACH IN HARDWARE.

The round, its heads, the launcher and the fire-control boundary are held to one set of top-level requirements, so that a change on one side of an interface can be traced to the other.

REQUIREMENT	HOW THE DESIGN MEETS IT
Defeat a small uncrewed aircraft by collision or capture	A kinetic head or a capture head on one nose interface
Carry no warhead, fuze or energetic material	A design boundary: none is anywhere in the round
Operate with no radio and no satellite navigation on the round	Tier 1 preset: the launcher lays the shot and nothing aboard receives
Launch from 30 bar shop air	189.2 m/s at the muzzle from a 3.00 m stroke
Fly stably with a static margin of at least 1.5 calibres	The stepped Ø32 boom and six fixed fins, inside the 1.5 to 2.5 calibre design band
Survive the launch shock	Every part sized to the 1,159 g peak at a safety factor of 2.0
Accept a partner fire-control cue as a permissive only	The cue cannot bypass the interlock chain or the arm action
Be manufacturable on the company's own tooling	Moulds for every moulded part are cut in-house

04 · THE LAUNCH

THIRTY BAR OVER THREE METRES. 189.2 METRES A SECOND AT THE MUZZLE.

A fixed volume of air expands into the growing barrel behind a cup that spans the full Ø90 bore. The round leaves the muzzle carrying 28.64 kJ.

The figures come from an isentropic expansion of the accumulator charge into the barrel behind the round, with the valve opening and the seal drag modelled. The obturator cup takes the full charge across 63.617 cm² of bore and pushes everything ahead of it up the tube.

QUANTITY	FIGURE	BASIS
Charge pressure	30.0 bar	Design launch case, shop-air class
Stroke and bore	3.00 m, Ø90.00 mm	Design launch case
Accumulator volume per shot	15.9 L	Calculated, with the gas-inertia correction
Muzzle velocity	189.2 m/s	Design value the model closes on
Launch energy	28.64 kJ	Calculated, ½mv²

WHERE THE ENERGY GOES	LOSS	WHAT IT IS
Gas inertia	5.2 %	The charge air is accelerated along with the round
Heat transfer from the barrel	−2.0 %, a gain	The expanding gas cools and heat flows back into it
Seal friction	3.4 %	The obturating land against the bore
Blow-by past the obturator	0.5 %	A pressure-energized cup
Fin-tip contact with the bore	0.2 %	Six tips
Combined energy efficiency	85.9 %	Against the ideal expansion

Gas inertia is the largest term and no seal recovers it: sealing costs about 3.9 points in all, while the air itself costs 5.2. The lever on it is a smaller accumulator at higher pressure for the same stored energy, which puts less air in motion behind the round.

05 · LAUNCH SHOCK AND STRUCTURE

1,159 G AT THE PEAK. EVERY PART IS SIZED TO IT.

The peak arrives before the round has moved and is set by pressure, bore and mass alone. The mean over the stroke is 608 g; every part is sized to the peak at a safety factor of 2.0.

THE ARITHMETIC

(30 − 1.013) BAR × 63.62 CM² ÷ 1.6 KG = 11,369 M/S², 1,159 G

Peak base force occurs at x = 0, before the round moves, so accumulator volume sets exit velocity and leaves the peak untouched. A 20 ms valve ramp gives the same peak as an instant one. The only levers on launch shock are lower pressure, a smaller bore or a longer stroke.

At the critical station just ahead of the cup the shell carries the whole round at peak acceleration: 18,191 N in axial compression. Buckling governs the wall, not strength, by roughly 1.8 times. Conditioned PA66-GF33 needs 1.19 mm to carry the load and 2.14 mm to stay stable under it, so the moulded wall is 2.50 mm, a section a mould fills evenly. A strength-only sizing would have produced a 1.2 mm wall and a round that folds in the tube.

MEMBER AND MODE	APPLIED	ALLOWABLE	MARGIN OF SAFETY
Fin root, bending	7.5 MPa	110 MPa	+13.7

06 · STABILITY

SEVENTY DOWN TO THIRTY-TWO. SIX FIXED FINS ON THE BOOM.

A body at bore diameter leaves the fins no span and the round tumbles. Stepping the tail down to a Ø32 boom gives six fixed fins the span to hold the round stable, inside the 1.5 to 2.5 calibre design band.

LAYOUT	STATIC MARGIN	RESULT
Fins flush to a Ø90 body	−0.80 calibres	Tumbles
Body reduced to Ø76	−0.64 calibres	Tumbles
Ø70 body on a Ø40 boom	−0.24 calibres	Tumbles
Ø70 body on a Ø32 boom	Inside the 1.5 to 2.5 calibre band	Stable

The step is not free. The cone from Ø70 to Ø32 carries a negative normal-force slope well aft of the centre of gravity, so the fins have to overcome the step as well as the nose. Four fins do not close the solve and eight put the round over-stable; six hold it inside the band, where an unguided body needs to be, because nothing downstream corrects what the airframe gets wrong.

The fins are bonded fixed. A muzzle-set trim mechanism would add a moving part qualified to the launch shock, a mating feature on every round and a fixture on every tube, for a round whose dispersion is set by the launcher's aim. The launcher aims; the round flies ballistic, its attitude decided by its geometry alone.

07 · FLIGHT AND EFFECT

BALLISTIC FROM THE FIRST METRE. COLLISION IS THE WHOLE EFFECT.

The trajectory is decided at the mount and nothing reaches the round after the muzzle. The table is a point-mass solution at ISA sea level with a drag coefficient of 0.35, a handbook value, on the Ø70 reference.

QUADRANT ELEVATION	RANGE	TIME OF FLIGHT	IMPACT VELOCITY	IMPACT ENERGY
5°	525 m	3.20 s	144.7 m/s	16.8 kJ
10°	894 m	6.10 s	120.6 m/s	11.7 kJ
15°	1,165 m	8.77 s	107.0 m/s	9.2 kJ
20°	1,364 m	11.24 s	99.7 m/s	8.0 kJ
30°	1,599 m	15.65 s	95.4 m/s	7.3 kJ
45°	1,636 m	21.14 s	99.7 m/s	8.0 kJ

Structurally destroying a light composite or polymer airframe is an order-of-magnitude 0.1 to 1 kJ proposition, and across the table the round arrives with between 7.3 and 16.8 kJ. Energy is not the constraint on this line. Miss distance is, and miss distance belongs to the cue, the laying solution and the mount rather than to the round.

A round that misses lands with that same impact energy, on the arc the laying solution set, and a high-angle solution and a flat one put it in very different places. The design answers with an exclusion zone over the full muzzle arc and downrange, kept clear while the launcher is armed and firing; the area-clear key must be made before the launcher will arm.

08 · MATERIALS AND MANUFACTURE

FOUR MATERIAL CLASSES IN THE ROUND. EVERY MOULD CUT IN-HOUSE.

A steel, a glass-filled nylon, a sealing elastomer and a structural epoxy. The register is four lines long, and nothing on it burns.

WHERE	MATERIAL CLASS	DESIGN BASIS
Nose	Alloy steel, AISI 4140 class, normalized	A mass item chosen for density, 7,850 kg/m³
Body shell, tail boom, fins, cup body	Glass-filled polyamide, PA66-GF33	110 MPa and 7.0 GPa conditioned at 50 % RH, handbook values
Obturating land	Thermoplastic polyurethane or filled PTFE	The sealing face against the bore
Bonds	Two-part structural epoxy	Lap shear 20–30 MPa, handbook value

Conditioned values are used throughout. Glass-filled nylon loses roughly 40 % of its strength and 33 % of its stiffness as it takes up moisture, and the round is sized to the in-service case rather than to the dry part. The nose is a mass item, not a strength item: any dense, tough, non-frangible steel that makes the mass in its envelope serves.

Every moulded part is made in-house, on moulds cut with the company's own five-axis capability, and the nose is plain turned bar well inside existing machine-shop work. Bar stock, polymer pellets, the structural adhesive and the obturator elastomer are bought in. No process in the round is new to the shop.

09 · THE ENGAGEMENT

A CUE PROPOSES. A PERSON ARMS. THEN THE ROUND IS ON ITS OWN.

The round takes no part in its own engagement. The launcher lays it, a named person arms the launcher, and a normally closed valve releases it.

1. **Cue.** Bearing, range and height reach the launcher over a wire from the customer's fire-control interface, or a person enters them by hand.
2. **Lay.** The launcher computes a point-mass laying solution, with lead for a moving target, and checks it against the mount's ±170° of azimuth and −3° to +75° of elevation. A solution outside that envelope is refused.
3. **Arm.** Four permissives in series have to be made before the arm relay energizes, among them an area-clear key that is made only when the full muzzle arc and the ground downrange are clear. A person turns the arm key for every shot. Nothing on the round changes state, because there is nothing aboard to arm.
4. **Fire.** The normally closed breech valve opens in under 5 ms. With no power on the coil the breech stays shut.
5. **Flight.** Six fixed fins are live from the first metre. No link, signal or correction reaches the round after the muzzle.
6. **Reload.** The breech resets and the magazine indexes. The pace of the next shot is set by how fast the compressor restores the working pressure.

- ✓ A partner fire-control cue is a permissive only, and it can never bypass the manual interlock chain or the arm action.
- ✓ No automated or remote-only fire path exists on this line.
- ✓ Detection, tracking and classification are the customer's own systems; the launcher's own sensing is a pressure transducer and a boresight reference.

10 · HEADS

ONE MECHANICAL NOSE INTERFACE. A KINETIC HEAD OR A CAPTURE HEAD.

Every head mounts to the same nose interface and no electrical conductor crosses it on any head. The launcher delivers the same 30 bar over the same 3.00 m stroke to whichever is loaded.

BASELINE · CS-110

THE KINETIC HEAD

A solid alloy-steel nose behind a flat Ø70 face, with no cavity, no chemistry and no mechanism. It carries most of the round's mass and the whole of the effect, which is collision.

CAPTURE · CS-111

THE ENCAPSULATOR CAPTURE HEAD

The same airframe aft of the nose bulkhead, with a capture bay forward of it: a stored energy source, the capture medium, a dispersal head and a mechanical release. It is held to the round's 1.6 kg, bore and magazine pitch so the two index in one magazine, and it has a specification sheet of its own.

RELEASE MECHANISM

THE COLLAPSE TRIGGER

Not a third head and not a product of its own. A capture nose collapses mechanically on contact and the collapse itself releases the net or canopy, with no initiator, no electrical path and no proximity sensing.

11 · DOCTRINE AND SAFETY

A CARRIER, NEVER A MUNITION. A PERSON ARMS EVERY SHOT.

The lines that hold for this round on every launch platform and for every customer.

- Carriers, not munitions: no warhead, no fuze, no primer, no propellant and no energetic material anywhere in the round, and nothing on it operates a weapon.
- Nothing aboard transmits or receives: the round carries no battery, no receiver, no antenna and no satellite navigation. Nothing in the fleet transmits by radio and nothing guides on a link.
- Human safety comes first, on every line: a person arms every shot, a partner cue is a permissive and never a trigger, and no automated or remote-only fire path exists.
- A round that misses still lands with 7.3 to 16.8 kJ, so the full muzzle arc and the ground downrange are an exclusion zone, kept clear while the launcher is armed and firing; the area-clear key must be made before it will arm.
- Stored air at 30 bar is the dominant hazard at the launcher itself: nobody is inside the exclusion zone around the accumulator while it charges.

THE CONVERSATION

BRING THE SECTOR YOU HAVE TO HOLD. WE ANSWER WITH THE ROUND AND THE TUBE.

A first conversation needs the airspace to be held, the ground a launch platform can stand on, the sensing already in place and the magazine depth the threat picture asks for. Every enquiry is screened.

Start a screened enquiry at cdnshield.ca/enquiries.

DOCUMENT	CDN-PROD-SPC-001 · Goose CS-110 · Specification sheet
REVISION	R1.0 · issued 2026-09-10
WEB VERSION	cdnshield.ca/cdns-uav-platforms/spec-sheets/goose · carries the current revision
RELATED SHEETS	Encapsulator CS-111 · CS-120 · The Launch Platform
ISSUED BY	Canadian Shield · cdnshield.ca