GENERAL ASTRONAUTICS
ARCA SPACE

CER-1200TR
TARGET ROCKET

USER GUIDE

14 October 2024, pre-release version 3

Content

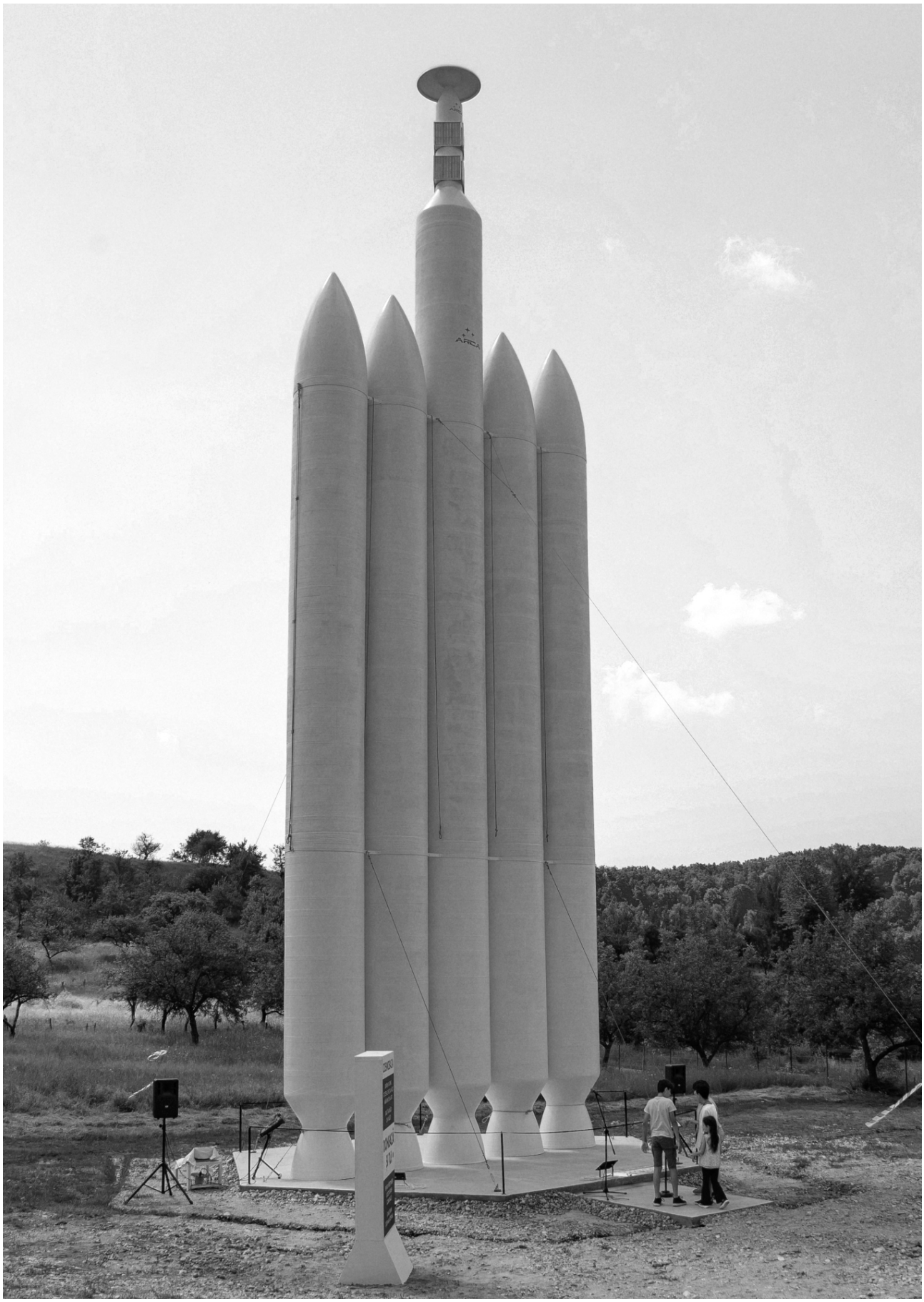
1. Introduction

1.1 Overview

CER-1200TR is an ecological, extremely cost effective rocket system, build as a target rocket for anti-ballistic, and anti-ship and anti-aircraft training.
The rocket could be launched from the ground, from vehicles, directly from the sea, or from a ship.
The rocket vehicle is expendable, however the ground support equipment is fully reusable.
Contrary to al present-day rockets, CER-1200TR uses no flammable or explosive propellants, but a mixture of water and hydrogen peroxide 30%-70% making it benign for the environment, simple and cost effective.
Also, the rocket employs no electronics, and it has just a single valve for engine start, making it extremely easy to operate, requiring no prior aerospace training.
Another important feature of the CER-1200TR is related to the fact that the amount of propellant in the tank can be adjusted prior to launch, accordingly to the needed flight trajectory.

1.2 Applications

CER-1200TR could be used as targets to simulate Short Range Ballistic Missiles (SRBMs), anti-ship missiles, and aircraft flying at altitudes up to 30km, ranges up to 60km and speeds up to Mach 2.6.
The range of simulated targets makes the CER-1200TR system suitable for users from the ground, naval and air forces.



CER-1200TR, four units

2.Product presentation

The CER-1200TR is the large size rocket vehicle from our offer, designed as a target vehicle for military applications.

2.1 Technical characteristics and performances

Characteristic	Data
Diameter (body only)	1.2 m
Diameter over fins	3.6 m
Length	14.6 m
Dry weight	300 kg
Propellant weight	10,000 kg
Payload weight, maximum	1,000 kg
Launch weight, maximum	11,300 kg
Engine run time	60 s
Altitude with maximum payload	40 km
Speed with maximum payload	2.6 Mach
Launch angle from horizontal	20 - 90°

Fig.1 - CER-1200TR comparison with a person.

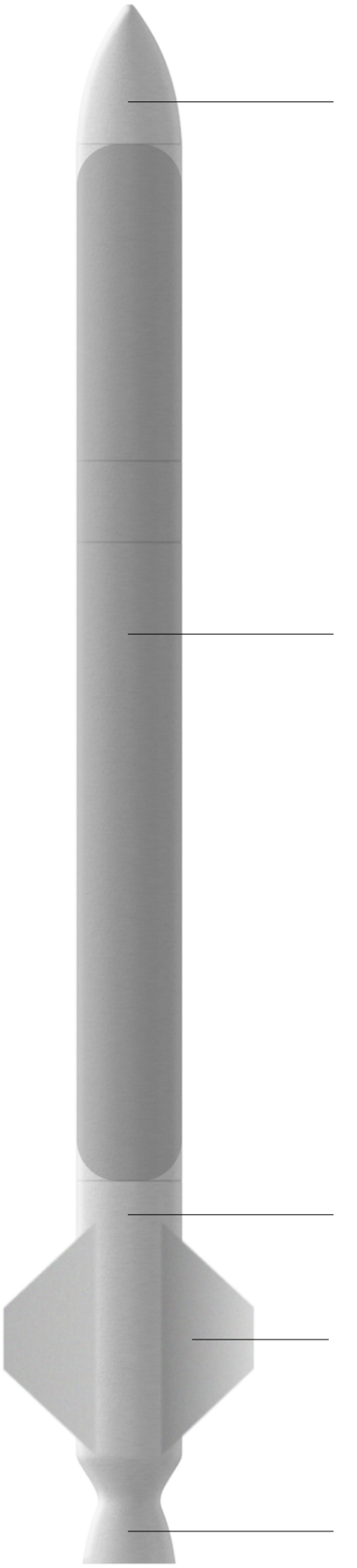


Fig.2 - CER-1200TR elements

2.2 Performance data

A series of diagrams are shown below, emphasising the CER-1200TR vehicle’s performance.

- Payload vs altitude

The CER-1200TR has the capability to carry 1,000 kg of payload. The below table presents the rocket’s altitude vs payload mass, if launched on a vertical trajectory:

Payload mass	Altitude
0	80 km
500	55 km
1,000	40 km

- Launch angle vs. altitude vs speed vs time vs. range

The simulations are considering the maximum payload of 1,000 kg. The launch angle is considered from horizontal.

Launch angle	Altitude	Speed, max.	Max. speed altitude	Flight Time	Range
90°	40 km	2.6 Mach	18 km	248 s	0 km
80°	39 km	2.55 Mach	17.5 km	250 s	14 km
70°	38 km	2.5 Mach	17 km	252 s	28 km
60°	35 km	2.45 Mach	16.5 km	254 s	40 km
50°	29 km	2.4 Mach	15 km	250 s	50 km
40°	22 km	2.3 Mach	12.5 km	248 s	54 km
30°	16 km	2 Mach	9.5 km	240 s	57 km
20°	10 km	1.75 Mach	7 km	250 s	60 km

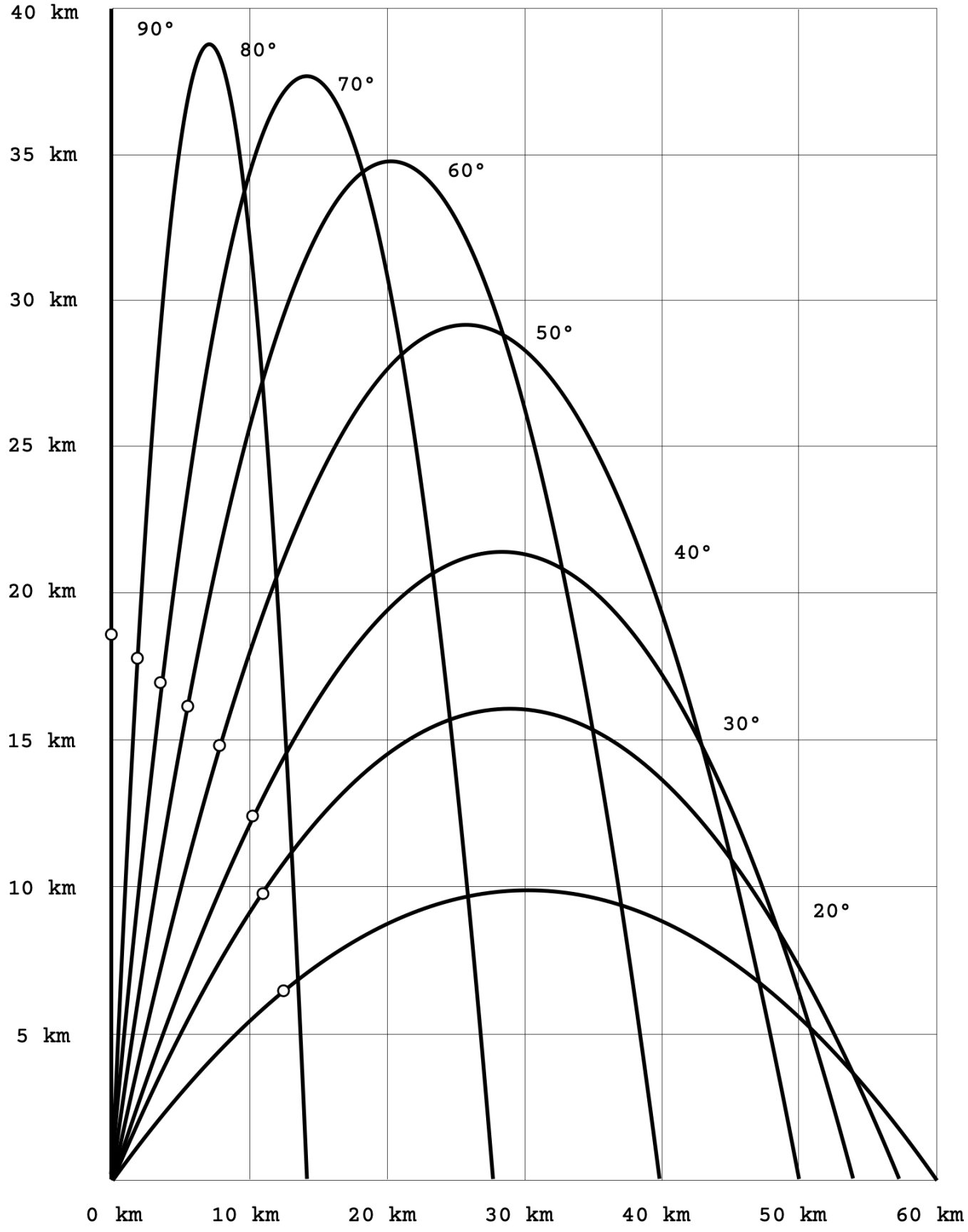


Fig.3 - CER-1200TR flight envelope.

- Propellant mass vs. altitude vs. Speed vs. Flight time

The CER-1200TR has the capability to be carry 1,000 kg of payload. The below table presents the rocket’s altitude vs payload mass, if launched on a vertical trajectory:

Propellant mass	Altitude	Speed, max	Flight time
10,000 kg	40 km	2.6 Mach	248 s
7,500 kg	22 km	2.3 Mach	156 s
5,000 kg	13 km	2.0 Mach	106 s
2,500 kg	7 km	1.7 Mach	66 s

3. Ground Support Equipment

Each CER version has a dedicated ground support system needed to fuel and launch the vehicle.

3.1 Launch canister
The launch canister has a diameter of 2.4 m and it is standing 16 m tall. Inside of the canister there are two launch rails on which the rocket is sliding from the engine start until it reaches minimum velocity for stable flight.

3.2 Propellant transfer pump
The propellant transfer pump is a stainless steel, hydrogen peroxide compatible pump able to transfer in the CER-1200TR tank the 8,000 litres mixture of water and hydrogen peroxide.

4. Prerequisites

The CER-1200TR system needs three major elements that must be provided locally by the end user in order to be able to launch the rocket:

4.1 Propellant
The propellant for the CER160 rocket is a mixture of water and hydrogen peroxide in the 30-70 ratio. The hydrogen peroxide already prepared in this ratio is commercially available everywhere in the world, and sold as hydrogen peroxide 70% concentration.
The user must procure locally 10,000 kg of 70% concentration hydrogen peroxide in order to fuel the rocket for launch. Also, the rocket works with 50% concentration hydrogen peroxide found in stores, but with flight performance loss.

4.2 Pressurant
After the rocket is fuelled, the tank must be pressurised at a pressure of 14 bar, prior to launch.
Various hydrogen peroxide compatible gases could be used. We recommend air from an air compressor (the most affordable option), helium (for the highest rocket performance), nitrogen, argon.

4.3 12V power source
A 12V, 5A external power source is needed.

5. Applications

5.1 List of compatible Short Range Ballistic Missiles (SRBMs)

The CER-1200TR is suitable to simulate the flight of Short Range Ballistic Missiles (SRBMs). CER-1200TR is suitable for this taking into account its similar size, weight and flight profile compared to the currently operational SRBMs.

The following relevant SRBMs that the CER-1200TR could simulate are presented below compared to the CER-1200TR:

- Scud B - USSR
- 9K720 Iskander - Russia
- KN-23 - North Korea
- Shahab-2 - Iran

- Scud B

Characteristic	Scud D	CER-1200TR
Diameter (body only)	0.88 m	1.2 m
Length	11.25 m	14.6 m
Launch weight, maximum	5,900 kg	11,300 kg
Altitude	150 km	40 km
Speed, maximum	5 Mach	2.6 Mach
Speed, terminal	~ 0.9 Mach	0.7 Mach
Range, maximum	300 km	60 km
Cost/unit	~$1,000,000	€199,900

– 9K720 Iskander

Characteristic	Iskander	CER-1200TR
Diameter (body only)	0.92 m	1.2 m
Length	7.3 m	14.6 m
Launch weight, maximum	3,800 kg	11,300 kg
Altitude	50 km	40 km
Speed, maximum	5.9 Mach	2.6 Mach
Speed, terminal	N/A	0.7 Mach
Range, maximum	500 km	60 km
Cost/unit	~$3,000,000	€199,900

– KN-23

Characteristic	Iskander	CER-1200TR
Diameter (body only)	~1 m	1.2 m
Length	8.7 m	14.6 m
Launch weight, maximum	3,415 kg	11,300 kg
Altitude	N/A	40 km
Speed, maximum	N/A	2.6 Mach
Speed, terminal	N/A	0.7 Mach
Range, maximum	450 km	60 km
Cost/unit	N/A	€199,900

- Shahab-2

Characteristic	Shahab-2	CER-1200TR
Diameter (body only)	0.88 m	1.2 m
Length	12.29 m	14.6 m
Launch weight, maximum	6,500 kg	11,300 kg
Altitude	~ 150 km	40 km
Speed, maximum	~ 5 Mach	2.6 Mach
Speed, terminal	~ 0.9 Mach	0.7 Mach
Range, maximum	500 km	60 km
Cost/unit	N/A	€199,900

5.2 List of compatible anti-ship missiles

The CER-1200TR is suitable to simulate the flight of anti-ship missiles in the terminal phase. CER-1200TR is suitable for this taking into account its similar size and terminal flight profile compared to the currently operational anti-ship missiles.
The following relevant anti-ship missiles that the CER-1200TR could simulate are presented below compared to the CER-1200TR:

- P-500 Bazalt - Russia
- P-700 Granit - Russia
- P-800 Onix - Russia

- P-500 Bazalt

Characteristic	P-500 Bazalt	CER-1200TR
Diameter (body only)	0.88 m	1.2 m
Length	11.7 m	14.6 m
Launch weight, maximum	4,800 kg	11,300 kg
Altitude	5 km - 50 m	40 km
Speed, maximum	3 Mach	2.6 Mach
Speed, terminal	+ 1 Mach	0.7 Mach
Range, maximum	500 km	60 km
Cost/unit	N/A	€199,900

NOTE: This is one of the few supersonic anti-ship cruise missiles, using both conventional and nuclear warheads, posing a significant threat to any fleet. A design followed by the P-700 Granit.

– P-700 Granit

Characteristic	P-700 Granit	CER-1200TR
Diameter (body only)	0.85 m	1.2 m
Length	10 m	14.6 m
Launch weight, maximum	7,000 kg	11,300 kg
Altitude	17 km - 25 m	40 km
Speed, maximum	+2.5 Mach	2.6 Mach
Speed, terminal	1.6 Mach	0.7 Mach
Range, maximum	625 km	60 km
Cost/unit	N/A	€199,900

– P-800 Onix

Characteristic	P-800 Onix	CER-1200TR
Diameter (body only)	0.7 m	1.2 m
Length	8.9 m	14.6 m
Launch weight, maximum	3,000 kg	11,300 kg
Altitude	10 m	40 km
Speed, maximum	2.6 Mach	2.6 Mach
Speed, terminal	+1 Mach	0.7 Mach
Range, maximum	625 km	60 km
Cost/unit	$1,250,000	€199,900

5.3 List of compatible aircraft

In the case of attack aircraft and fighter jets the rocket has a similar length as well as similar fuselage diameter, while the stabilisers have a generous surface area, all of these generating a compatible RADAR signature. Additionally, if needed Luneburg lens RADAR reflectors can be used onboard.
The following relevant attack aircraft and fighter jets that the CER-1200TR could simulate are presented below compared to the CER-1200TR:

- F-16C - US
- A-10 - US
- MiG-21bis - Russia
- Su-25K - Russia
- J-7 - China
- Saab J39 - Sweden

– F16C - Fighting Falcon

Characteristic	F-16C	CER-1200TR
Fuselage diameter	~ 1.2 m	1.2 m
Length	15 m	14.6 m
Wing area	28 m^2	12 m^2
Weight, maximum	19,000 kg	11,300 kg
Altitude	15 km	40 km
Speed, maximum	2.05 Mach	2.6 Mach
Speed, sea level	1.2 Mach	0.7 Mach
Range, maximum	546 km	60 km
Cost/unit	~$20,000,000	€199,900

– A-10 Thunderbolt II

Characteristic	A-10	CER-1200TR
Fuselage diameter, estimate	~ 1.2 m	1.2 m
Length	16.26 m	14.6 m
Wing area	47 m^2	12 m^2
Weight, maximum	22,680 kg	11,300 kg
Altitude	13.6 km	40 km
Speed, maximum	0.6 Mach	2.6 Mach
Speed, sea level	0.5 Mach	0.7 Mach
Combat radius / Range, maximum	463 km	60 km
Cost/unit	~$13,400,000	€199,900

- MiG-21bis

Characteristic	MiG-21bis	CER-1200TR
Fuselage diameter, estimate	~ 1.2 m	1.2 m
Length	14.7 m	14.6 m
Wing area	23 m^2	12 m^2
Weight, maximum	10,400 kg	11,300 kg
Altitude	17.5 km	40 km
Speed, maximum	2.05 Mach	2.6 Mach
Speed, sea level	1.06 Mach	0.7 Mach
Combat radius / Range, maximum	~ 400 km	60 km
Cost/unit	~$4,000,000	€199,900

– Su-25K

Characteristic	Su-25K	CER-1200TR
Fuselage diameter, estimate	~ 1.2 m	1.2 m
Length	14.9 m	14.6 m
Wing area	33.7 m^2	12 m^2
Weight, maximum	19,300 kg	11,300 kg
Altitude	7 km	40 km
Speed, maximum	0.79 Mach	2.6 Mach
Speed, sea level	0.55 Mach	0.7 Mach
Combat radius / Range, maximum	750 km	60 km
Cost/unit	~$15,000,000	€199,900

– J-7

Characteristic	J-7MG	CER-1200TR
Fuselage diameter, estimate	~ 1.2 m	1.2 m
Length	14.2 m	14.6 m
Wing area	24.88 m^2	12 m^2
Weight, maximum	9,100 kg	11,300 kg
Altitude	17.5 km	40 km
Speed, maximum	2 Mach	2.6 Mach
Speed, sea level	0.9 Mach	0.7 Mach
Combat radius / Range, maximum	850 km	60 km
Cost/unit	~$3,000,000	€199,900

5.4 List of compatible anti-SRBM systems

Defending against SRBMs is a task that was successfully solved in the past decades and currently there is a serious number of anti-SRBMs operational systems around the world.

The following anti-SRBM systems that are combat-proven or tested can be used for training against the CER-1200TR:

- MIM-104 Patriot - US
- S-300 - Russia
- S-400 - Russia
- Arrow 2 - Israel
- David’s Sling - Israel

– MIM-104 - PAC 3 - Patriot

The Patriot rocket system is one of the most combat-proven systems with a high record of SRBMs successful interceptions.

Characteristic	Data
Diameter (body only)	0.255 m
Length	5.2 m
Launch weight, maximum	312 kg
Intercept altitude, maximum	20 km
Intercept range, maximum	20 km
Speed, maximum	4.1 Mach
Cost/missile	~ $2,000,000

– S-300V - 9M82 antiballistic rocket

Another highly successful and combat-proven system is the S-300 that is both land based as well as sea-based.

Characteristic	Data
Diameter (body only)	0.85 m
Length	9.9 m
Launch weight, maximum	5,800 kg
Intercept altitude, maximum	40 km
Intercept range, maximum	30 km
Speed, maximum	~ 7.2 Mach
Cost/missile	~ $2,000,000

– S-400 - 9M96 antiballistic rocket

Similar to the S-300, the S-400 can operate as an anti-aircraft as well as an antiballistic system. The 9M96 rocket is specifically designed to intercept ballistic missiles through direct kinetic impact.

Characteristic	Data
Diameter (body only)	0.24 m
Length	4.75 m
Launch weight, maximum	333 kg
Intercept altitude, maximum	30 km
Intercept range, maximum	120 km
Speed, maximum	~ 2.9 Mach
Cost/missile	N/A

– Arrow 2

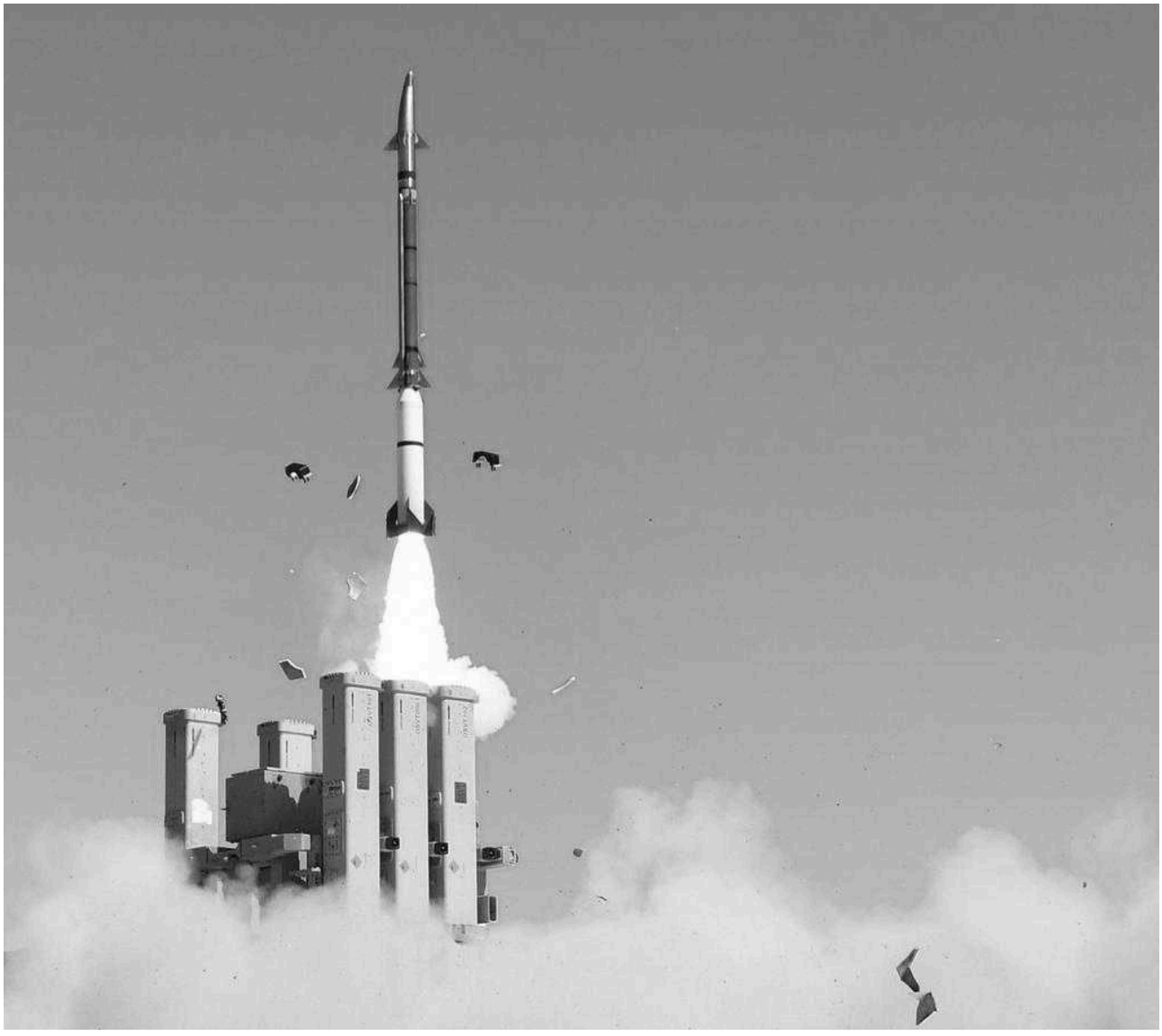
It is a dedicated anti-ballistic rocket system developed by Israel in cooperation with the US.

Characteristic	Data
Diameter (body only)	0.8 m
Length	6.95 m
Launch weight, maximum	1,300 kg
Intercept altitude, maximum	50 km
Intercept range, maximum	100 km
Speed, maximum	9 Mach
Cost/missile	$3,000,000

– David’s Sling

David’s Sling is a medium antiballistic defence system, that fills the gap between Israel’s Iron Dome and the Arrow 2 systems.

Characteristic	Data
Diameter (body only)	0.35 m
Length	4.6 m
Launch weight, maximum	400 kg
Intercept altitude, maximum	15 km
Intercept range, maximum	300 km
Speed, maximum	7.5 Mach
Cost/missile	$1,000,000



5.5 List of compatible defensive anti-ship missile systems

The following anti-ship missile systems that are combat-proven or tested can be used for training against the CER-1200TR:

- RIM-66M - US
- 9M96 - Russia
- Phalanx - US
- AK-630 - Russia
- Goalkeeper - The Netherlands

- RIM-66M

It is a medium range surface to air missile currently in service with the US Navy, onboard Ticonderoga class cruisers and Arleigh Burke class destroyers.

Characteristic	Data
Diameter (body only)	0.343 m
Length	4.72 m
Launch weight, maximum	707 kg
Intercept altitude, maximum	25 km
Intercept range, maximum	170 km
Speed, maximum	3.5 Mach
Cost/missile	N/A

- 9M96

This rocket is used by the Russian Navy but it can also be found in the inventory of the land forces, used by the S-350 and S-400 systems.

Characteristic	Data
Diameter (body only)	0.24 m
Length	4.75 m
Launch weight, maximum	333 kg
Intercept altitude, maximum	20 km
Intercept range, maximum	40 km
Speed, maximum	N/A
Cost/missile	N/A

– Phalanx

The Phalanx CIWS, is US Navy’s main short range air-defence system and it’s also operational with various US allied navies around the world. It uses a RADAR controlled M61A1 20 mm Gatling gun with a Max/sustained rate of fire of 4,500 rounds per minute.

Characteristic	Data
Gun caliber	20 mm
Gun type	Gatling
Rate of fire, maximum	4,500 rounds/min
Intercept range	2 km
Cost/unit	~ $7 million

– AK-630M-2

This is the Russian equivalent to the US Phalanx CIWS. Although it has a larger caliber and a significantly higher firing rate, it is reportedly less precise compared to the latest versions of US counterpart.

Characteristic	Data
Gun caliber	30 mm
Gun type	Gatling
Rate of fire, maximum	10,000 rounds/min
Intercept range	5 km
Cost/unit	$9 million

– Goalkeeper

Another representative CIWS came from the Netherlands, exhibiting similar rate of fire as the Phalanx and the same caliber as the AK-630.

Characteristic	Data
Gun caliber	30 mm
Gun type	Gatling
Rate of fire, maximum	4,200 rounds/min
Intercept range	2 km
Cost/unit	$25 million

5.6 List of compatible anti-aircraft systems

Among the above-presented anti-SRBM systems, the MIM-104 Patriot, S-300 and S-400 are capable to perform anti-aircraft interceptions.
Beside the above-mentioned systems, below there is an additional list of systems that can engage and destroy cruise missiles and can be used for training against the CER-1200TR:

- NASAMS - US
- Buk - 9K37 - Russia
- Spyder - Israel
- MIM-23 Hawk, Phase III - US
- 9K33 Osa - URSS
- S-75M3 Volkhov - URSS
- Flakpanzer Gepard - Germany

- NASAMS

It is a surface to air rocket system that can fire the air-to-air AIM-120 AMRAAM as well as the AIM-9X Sidewinder missiles. Below is the data for the AIM-120 missile.

Characteristic	Data
Diameter (body only)	0.178 m
Length	3.65 m
Launch weight, maximum	161.5 kg
Intercept altitude, maximum	21 km
Intercept range, maximum	30 km
Speed, maximum	~ 2.4 Mach
Cost/missile	~ $1,000,000

– Buk -

The Buk system is also designed with the intend to intercept cruise missiles flying at low altitudes. Although the system is capable of operating with a large number of missile variants, below is the data for the 9K37 missile.

Characteristic	Data
Diameter (body only)	0.4 m
Length	5.5 m
Launch weight, maximum	685 kg
Intercept altitude, maximum	25 km
Intercept range, maximum	20.5 km
Speed, maximum	~ 2.6 Mach
Cost/missile	N/A

– MIM-23 Hawk, Phase III

Although unexpected due to its age, the Hawk rocket system makes this list due to its capability to engage cruise missiles and to the fact that it is still in service with a large number of countries.

Characteristic	Data
Diameter (body only)	0.37 m
Length	5 m
Launch weight, maximum	590 kg
Intercept altitude, maximum	20 km
Intercept range, maximum	45 km
Speed, maximum	2.4 Mach
Cost/missile	$250,000

– 9K33 Osa

This is a highly mobile, short range anti-aircraft system that was exported in numerous countries and it is still in service around the world.

Characteristic	Data
Diameter (body only)	0.206 m
Length	3 m
Launch weight, maximum	128 kg
Intercept altitude, maximum	4 km
Intercept range, maximum	12 km
Speed, maximum	1.8 Mach
Cost/missile	N/A

- S-75M3 Volkhov

Another old air defence system, but still operational with a number of countries is the Soviet S-75 system.
While used on large scale in the Vietnam and Middle East wars where it performed well, it is credited with one of the most famous interceptions performed during the Cold War.

Characteristic	Data
Diameter (body only)	0.7 m
Length	10.6 m
Launch weight, maximum	2,300 kg
Intercept altitude, maximum	25 km
Intercept range, maximum	45 km
Speed, maximum	3.5 Mach
Cost/missile	N/A

– Flakpanzer Gepard

Also an old system, the Gepard makes this list as it is still in service with a number of countries and it still proved its relevance in Ukraine where destroyed cruise missiles.

Characteristic	Data
Gun caliber	35 mm
Gun type	2xSingle barrel
Rate of fire, maximum	2x550 rounds/min
Intercept range	5.5 km
Cost/unit	~ $2 million

5.7 Engagement envelope for the presented anti-SRBM systems

The following table presents the engagement envelopes for the above-presented anti-SRBM systems.

System	Engagement altitude	Target speed	Target flight time	Engagement range
MIM-104 - PAC3	< 20 km	< 2.6 Mach	< 190 s	< 20 km
S300 - 9M82	< 40 km	< 2.6 Mach	< 254 s	< 30 km
S400 - 9M96	< 30 km	< 2.6 Mach	< 240 s	< 60 km
Arrow 2	< 50 km	< 2.6 Mach	< 254 s	< 60 km
David’s Sling	< 15 km	< 2.6 Mach	< 180 s	< 60 km

How to read the table:

Example 1
In the case of the MIM-104 - PAC 3 - Patriot system, the CER-1200TR rocket could be intercepted at altitudes up to 20 km, and maximum speeds of Mach 2.6, with a theoretical interception time of 190 s (taking into account the interceptor capability to detect the CER-1200TR immediately after launch), while the maximum engagement range is up to 20 km.

Example 2
In the case of S-300V equipped with the anti-ballistic 9M96 rocket, the CER-1200TR rocket could be intercepted at altitudes up to 40 km and a speed of Mach 2.6, with a theoretical interception time of 254 s, while the maximum engagement range is 60 km. Therefore, the for the whole flight envelope of CER-1200TR, in any launch scenario, there is a firing solution for the S-300V.

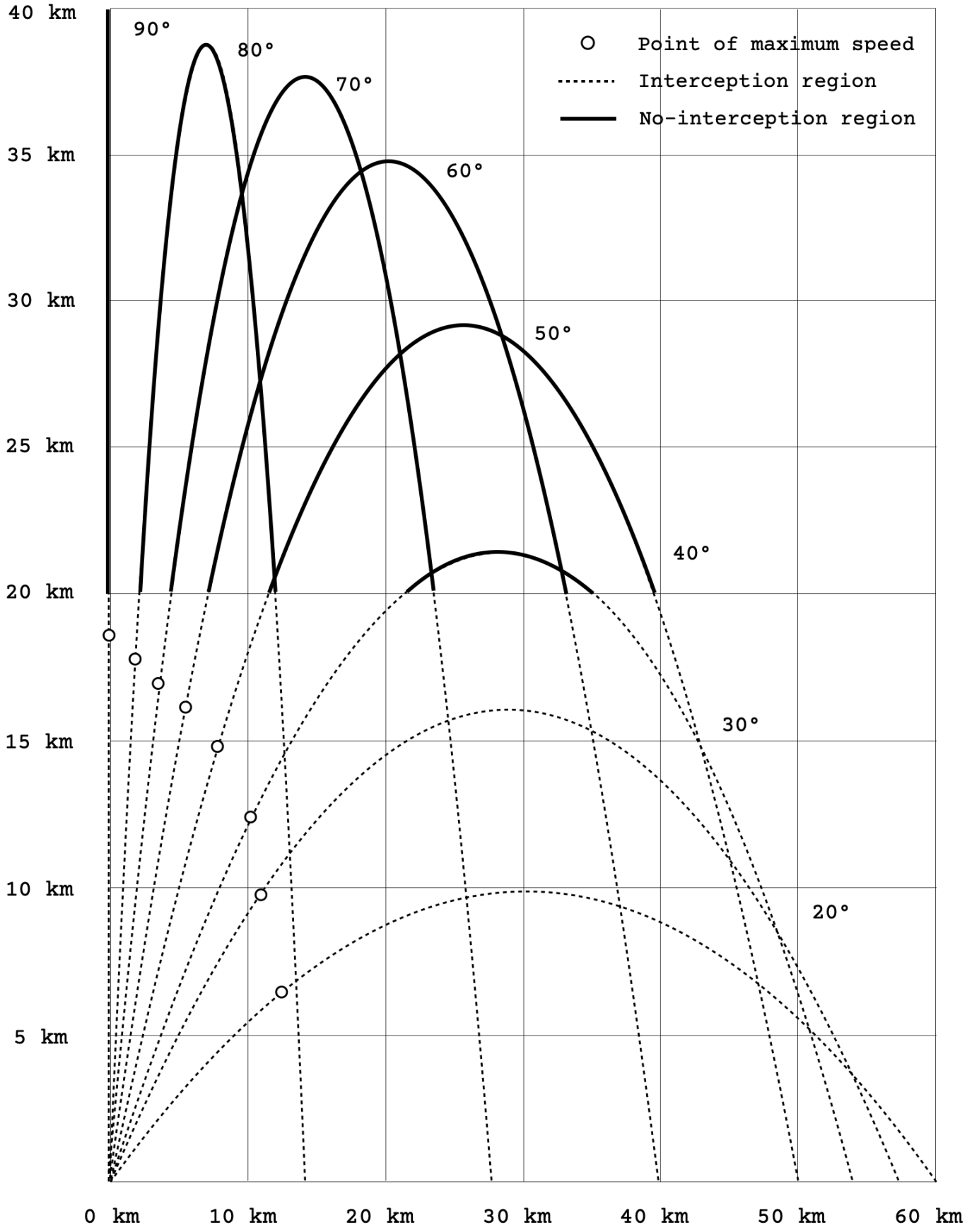


Fig.4 - MIM-104 - PAC 3 - Patriot, estimated interception envelope of CER-1200TR rocket.

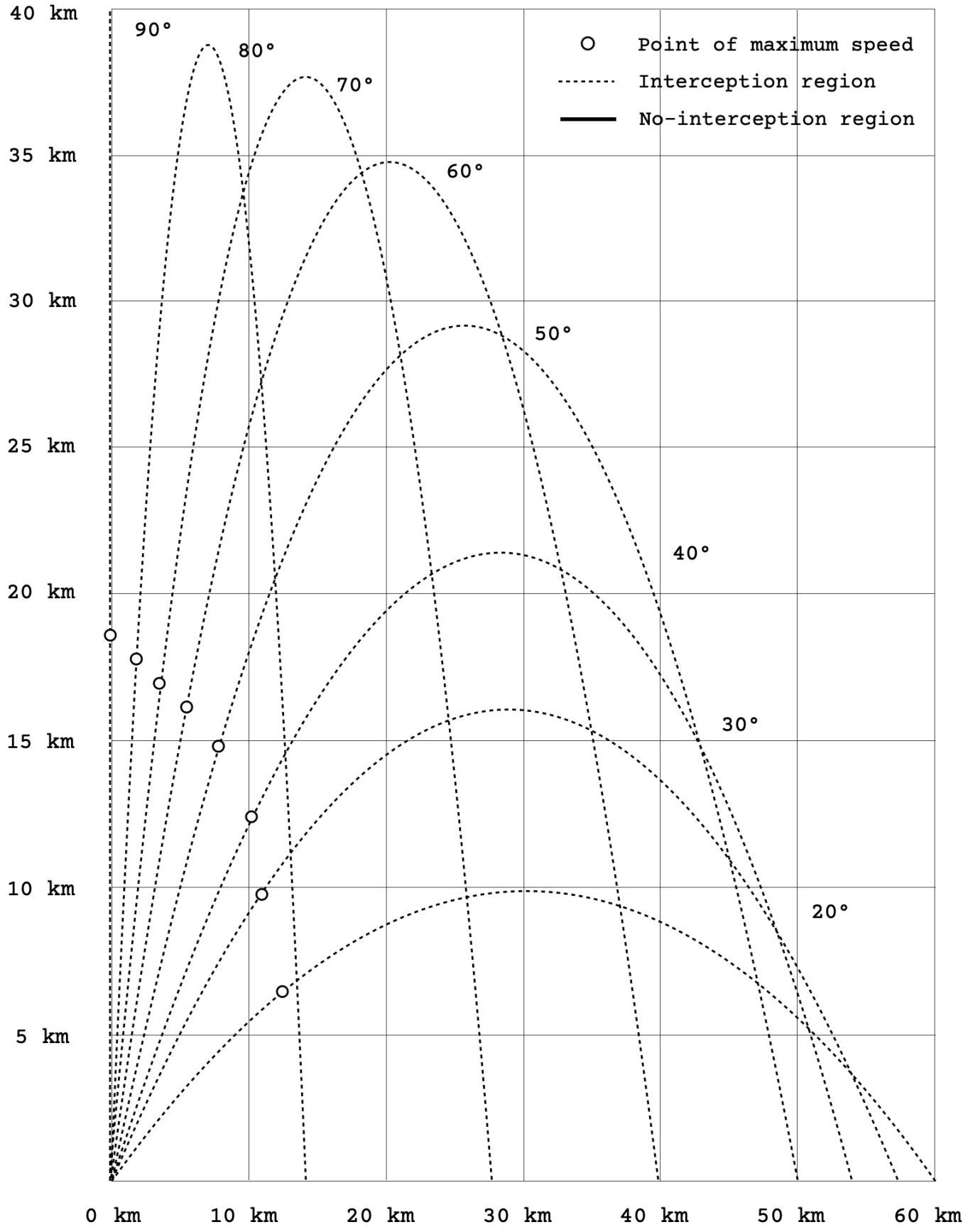


Fig.5 - S-300V - 9M82 and Arrow 2, estimated interception envelope of CER-1200TR rocket.

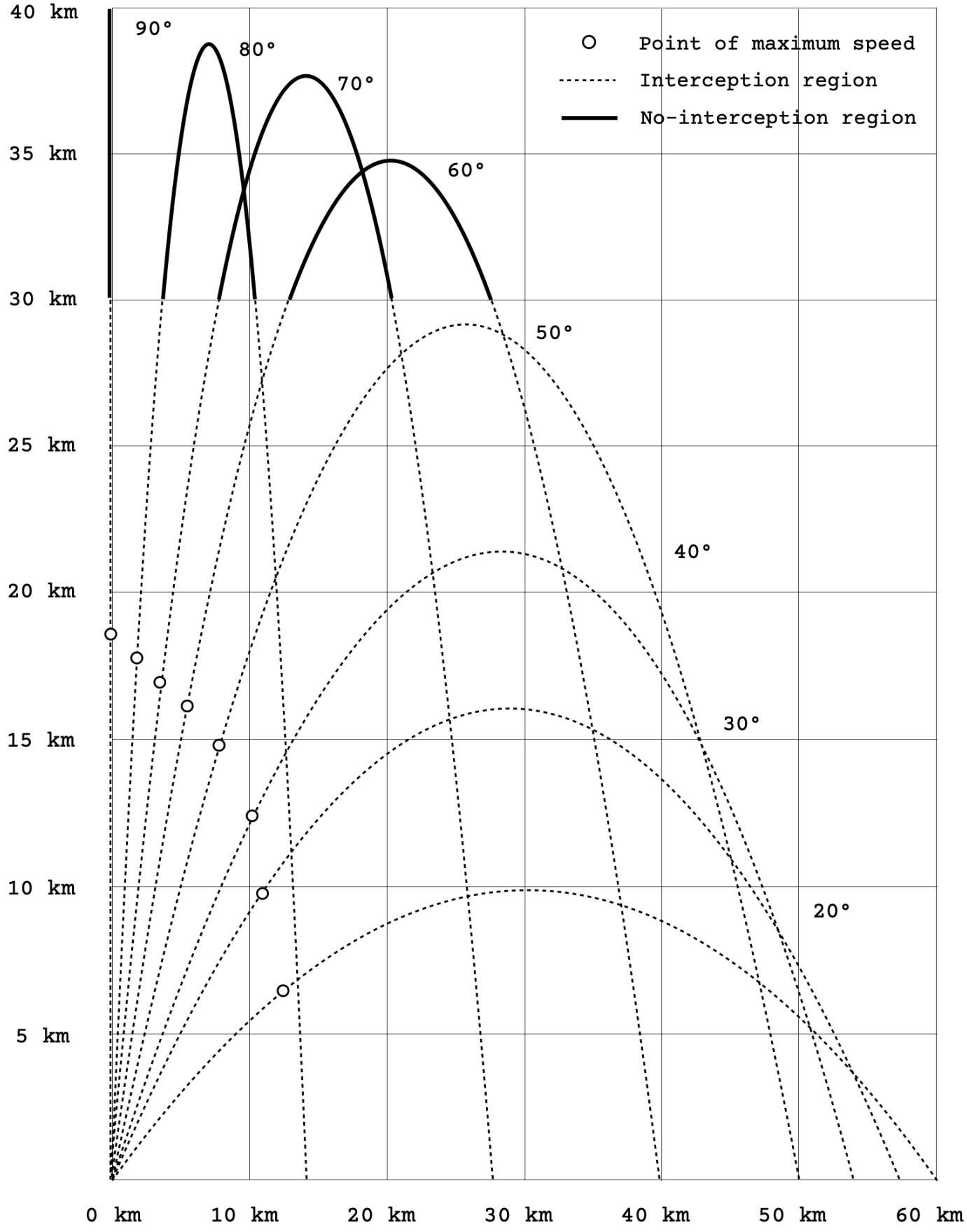


Fig.6 - S-400 - 9M96 estimated interception envelope of CER-1200TR rocket.

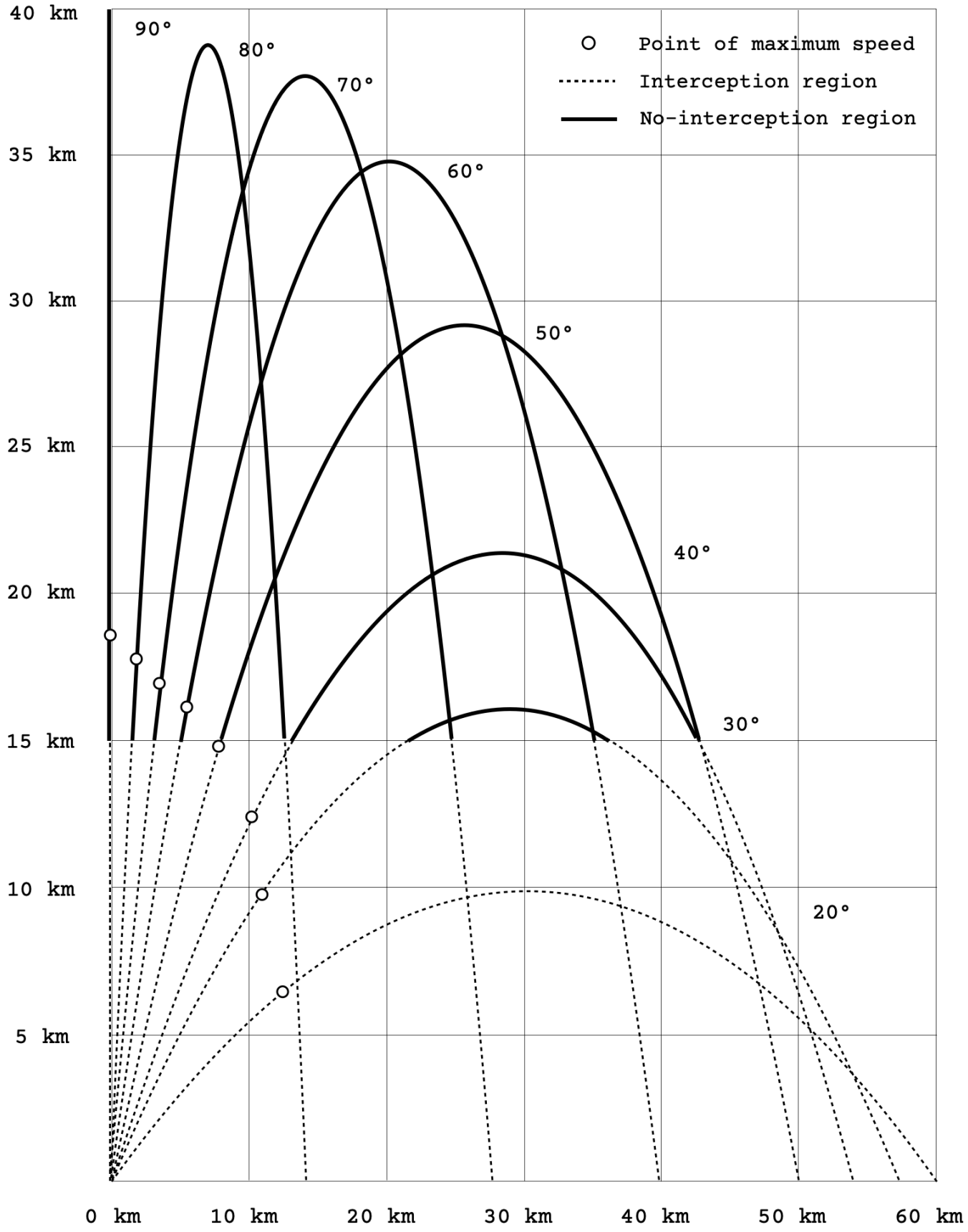


Fig.7 - David's Sling, estimated interception envelope of CER-1200TR rocket.

5.8 Engagement envelope for the presented defensive anti-ship missile systems

The following table presents the engagement envelopes for the above-presented defensive anti-ship missile systems.

System	Engagement altitude	Target speed	Target flight time	Engagement range
RIM-66M	< 25 km	< 2.6 Mach	< 240 s	< 60 km
9M96	< 20 km	< 2.6 Mach	< 230 s	< 40 km
Phalanx	< 2 km	< 0.7 Mach	< 28 s	< 2 km
AK-630M-2	< 5 km	< 0.8 Mach	< 37 s	< 5 km
Goalkeeper	< 2 km	< 0.7 Mach	< 28 s	< 2 km

How to read the table:

Example 1
In the case of the AK-630M-2 CIWS, the CER-1200TR rocket could be intercepted at altitudes up to 5 km, and maximum speeds of Mach 0.8, with a theoretical interception time of 37 s, while the maximum engagement range is also up to 5 km.

Example 2
In the case of the Phalanx CIWS, the CER-1200TR rocket could be intercepted at altitudes up to 2 km and a speed of Mach 0.7, with an interception time of 28 s, while the maximum engagement range is also 2 km.

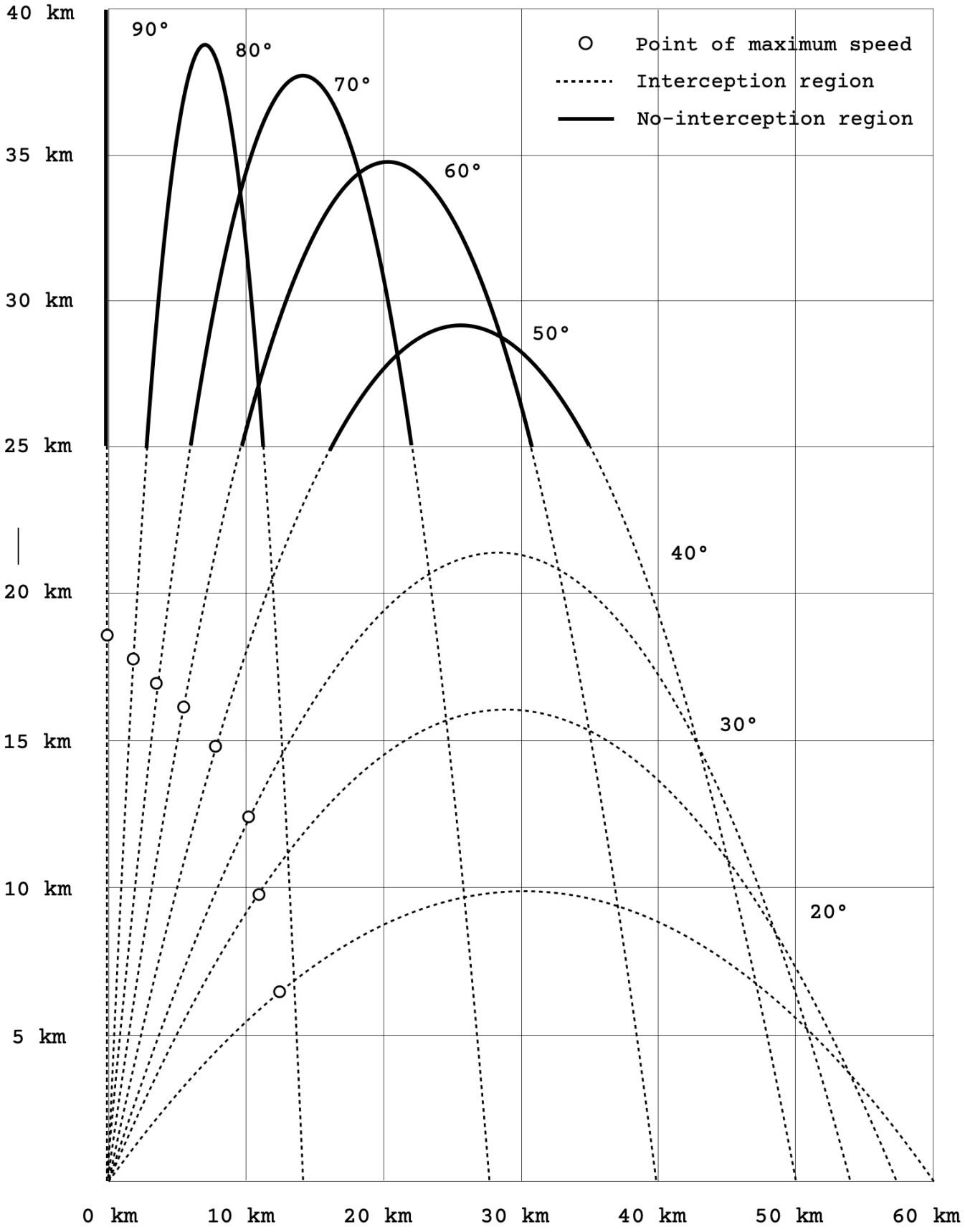


Fig.8 - RIM-66M, estimated interception envelope of CER-1200TR rocket.

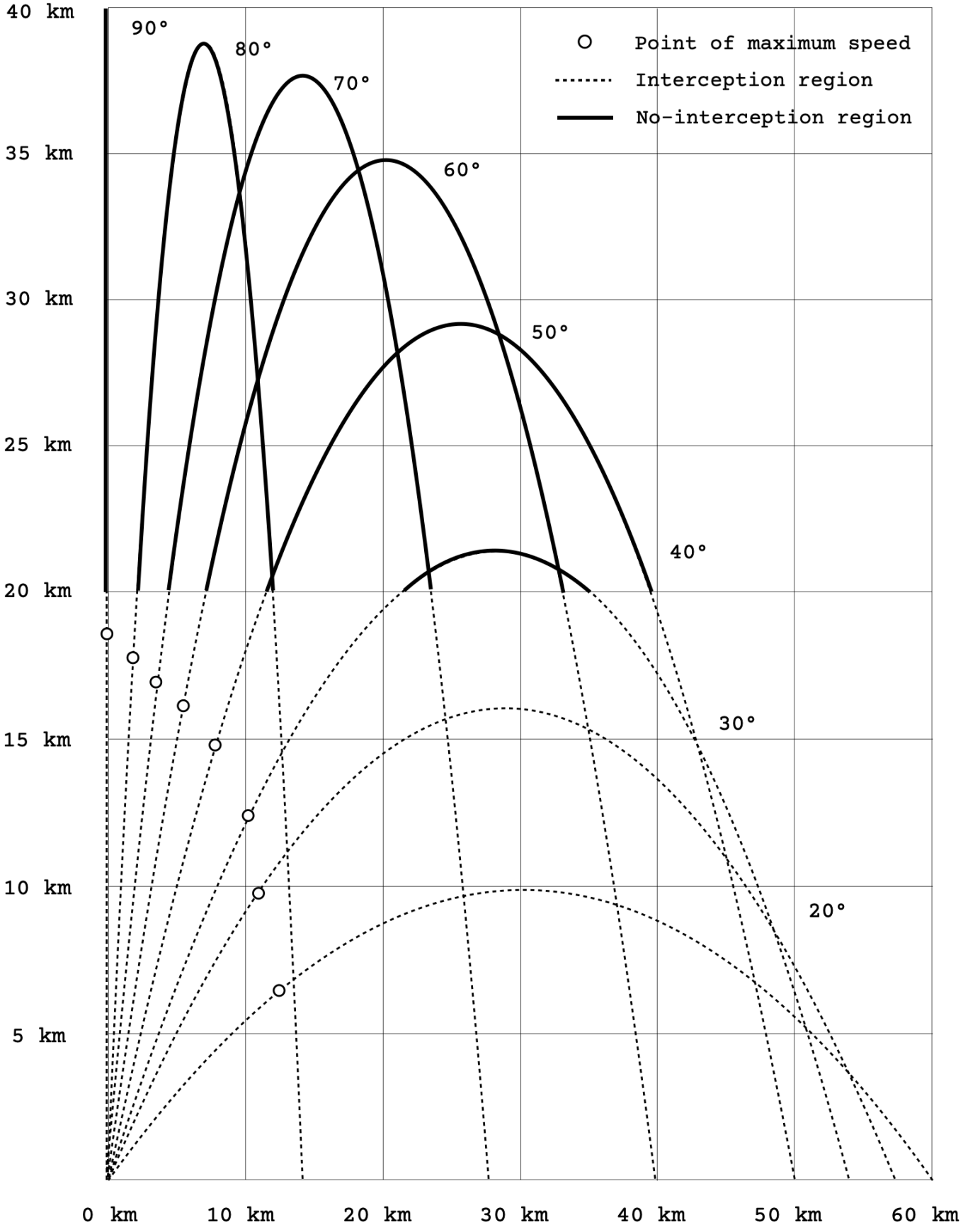


Fig.9 - 9M96, estimated interception envelope of CER-1200TR rocket.

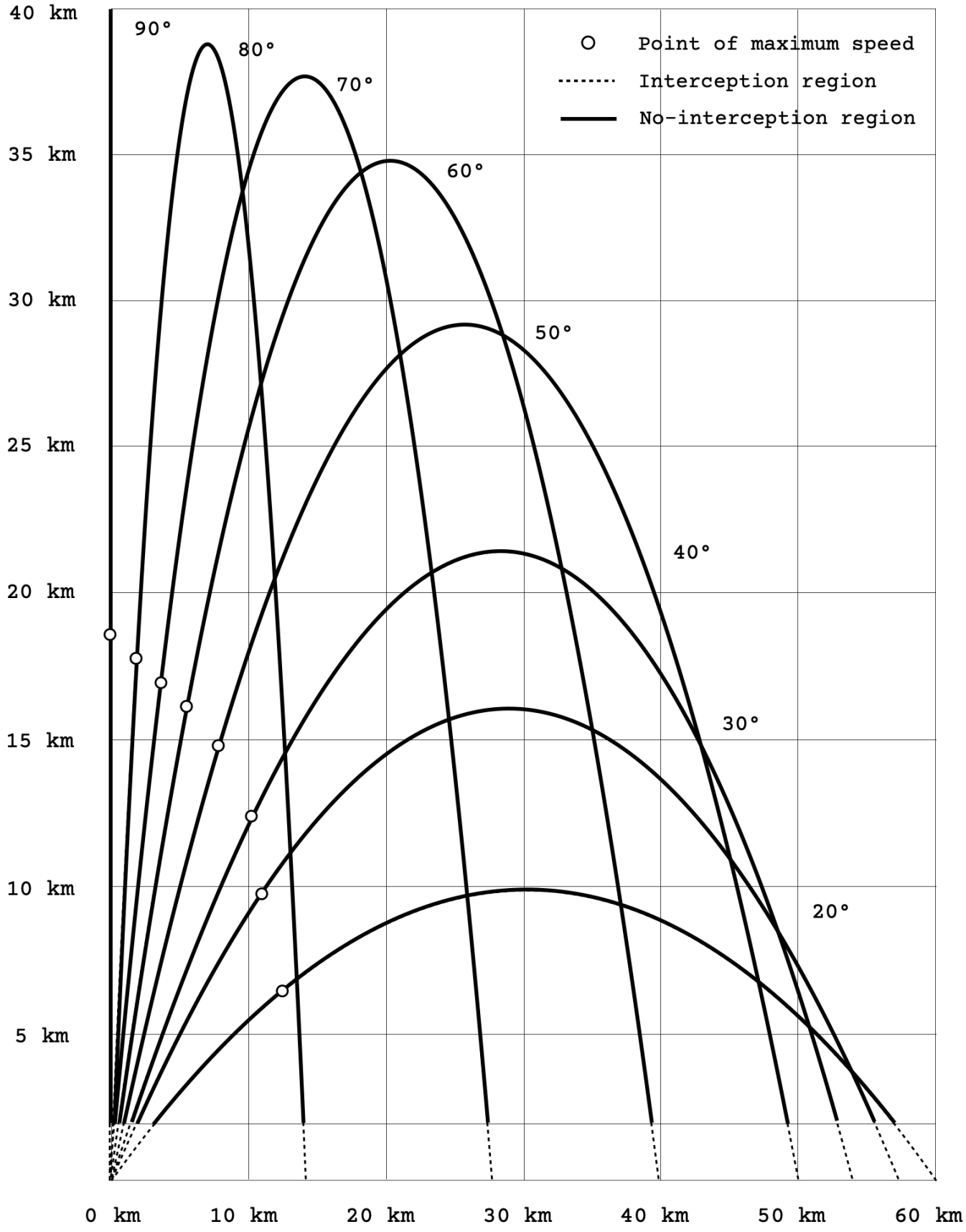


Fig.10 - Phalanx and Goalkeeper CIWS, estimated interception envelope of CER-1200TR rocket.

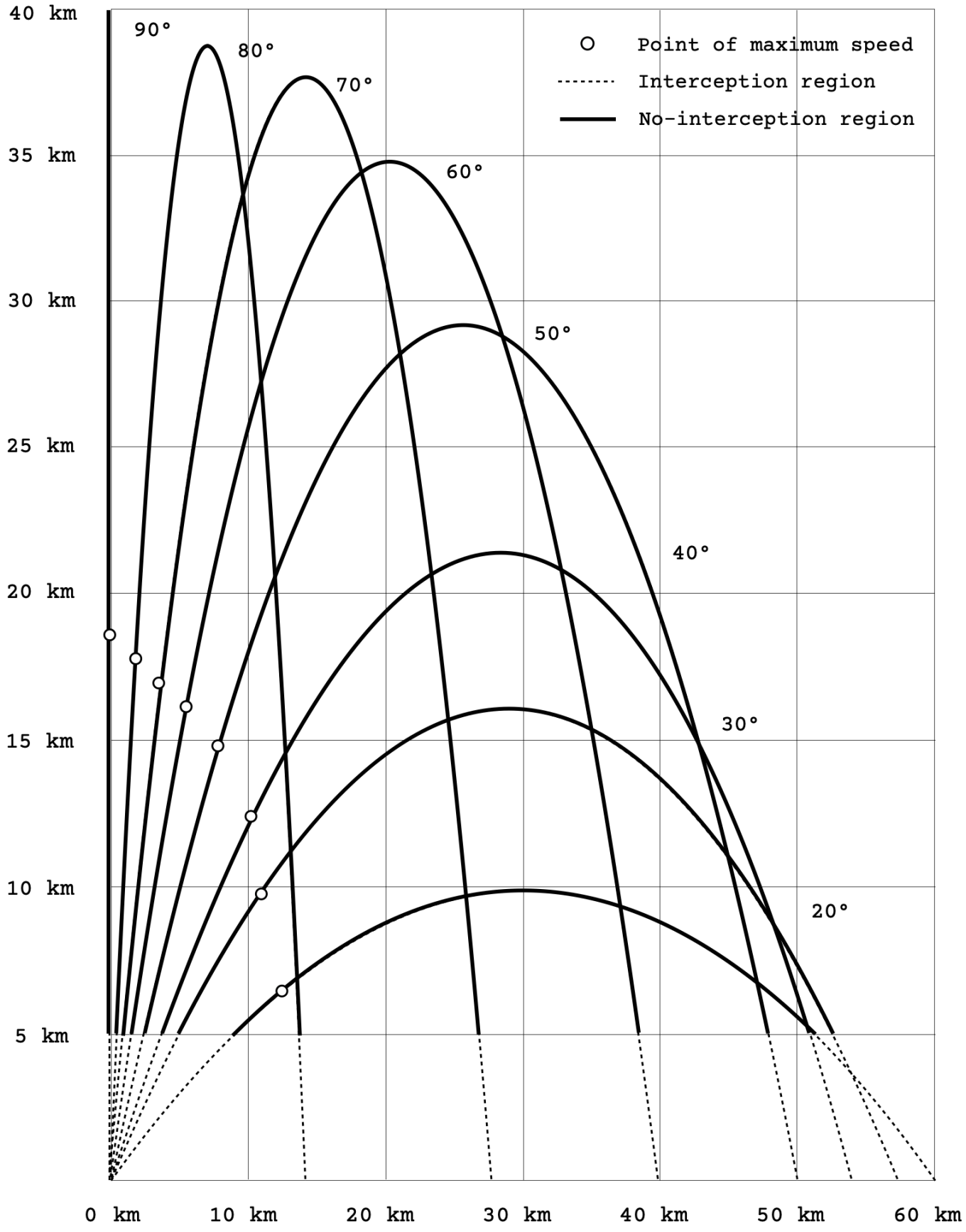


Fig.11 - AK-630M-2 CIWS, estimated interception envelope of CER-1200TR rocket.

5.9 Engagement envelope for the presented anti-aircraft systems

The following table presents the engagement envelopes for the above-presented anti-cruise missile systems.

System	Engagement altitude	Target speed	Target flight time	Engagement range
NASAMS	< 21 km	< 2.6 Mach	< 252 s	< 30 km
Buk	< 25 km	< 2.6 Mach	< 240 s	< 20.5 km
Spyder	< 9 km	< 2.6 Mach	< 185 s	< 20 km
MIM-23 - III	< 20 km	< 2.6 Mach	< 238 s	< 45 km
S-75M3	< 25 km	< 2.6 Mach	< 245 s	< 45 km
Gepard	< 5.5 km	< 0.7 Mach	< 38 s	< 5.5 km

How to read the table:

Example 1
In the case of the MIM-23 Phase III system, the CER-1200TR rocket could be intercepted at altitudes up to 20 km, and maximum speeds of Mach 2.6, with a theoretical interception time of 238 s (taking into account the interceptor capability to detect the CER-1200TR immediately after launch), while the maximum engagement range is up to 45 km.

Example 2
In the case of the Gepard system, the CER-1200TR rocket could be intercepted at altitudes up to 5.5 km and a speed of Mach 0.7, with an interception time estimated at 38 s, while the maximum engagement range is 5.5 km.

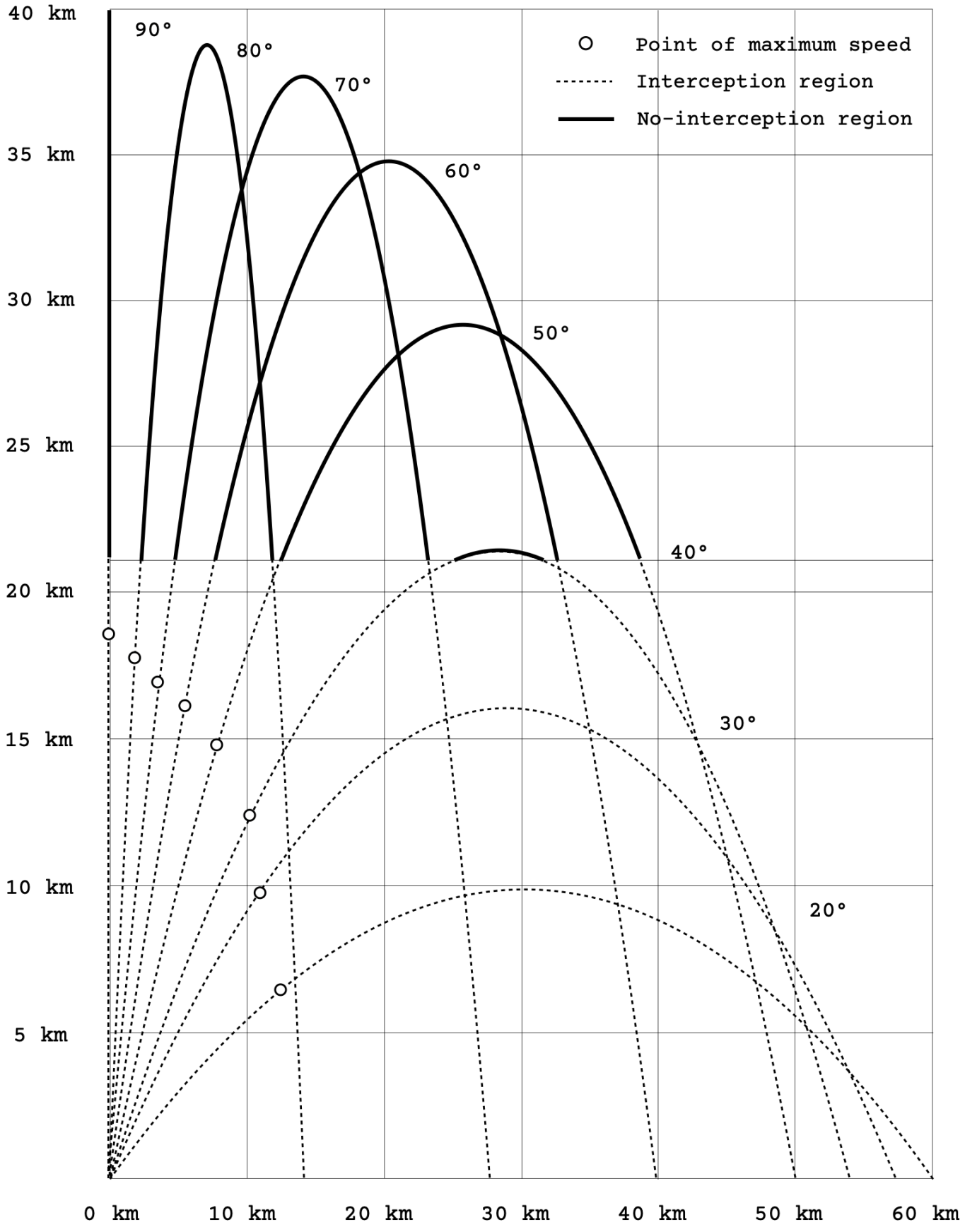


Fig.12 - NASAMS, estimated interception envelope of CER-1200TR rocket.

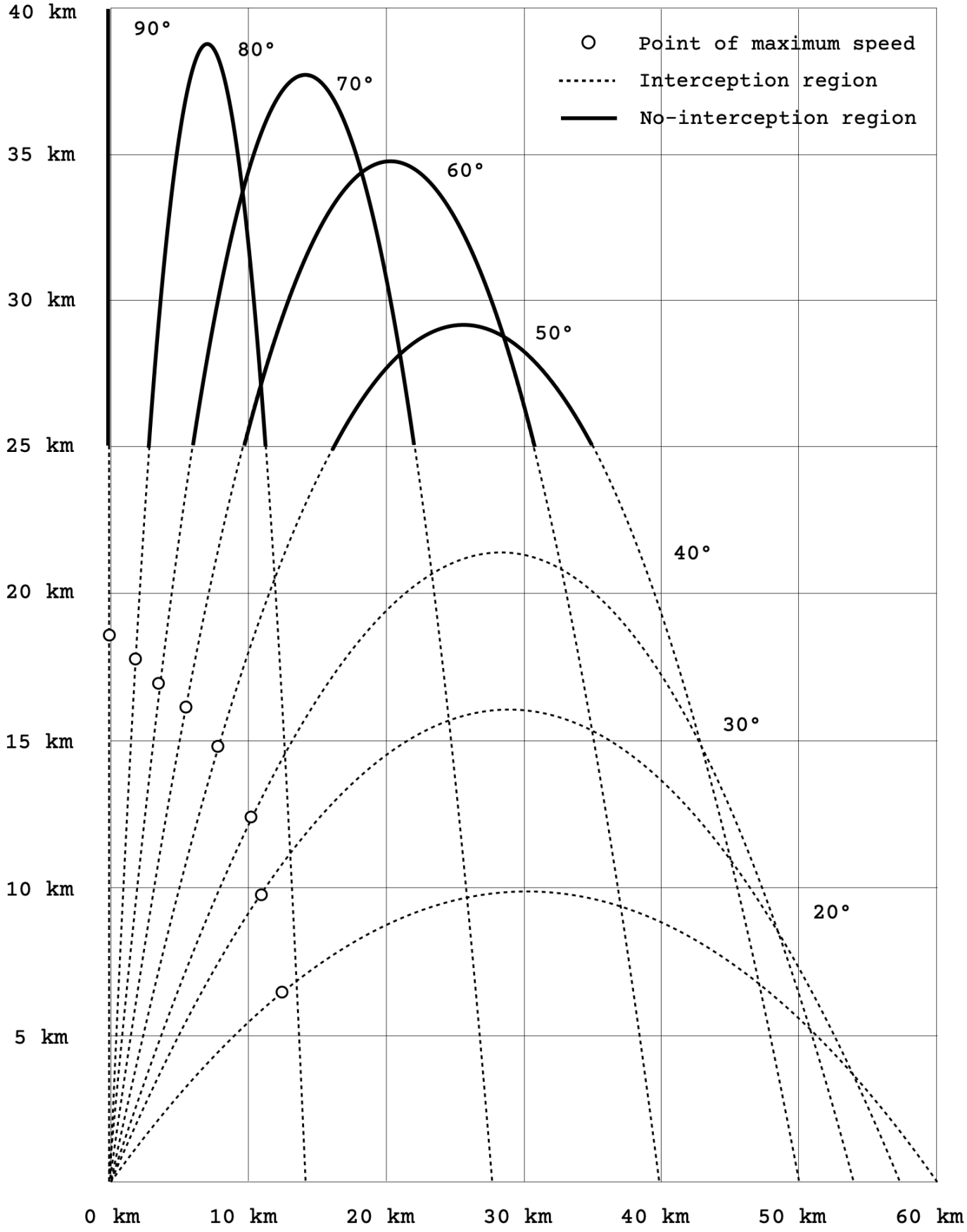


Fig.13 - Buk and S-75M3 Volkhov, estimated interception envelope of CER-1200TR rocket.

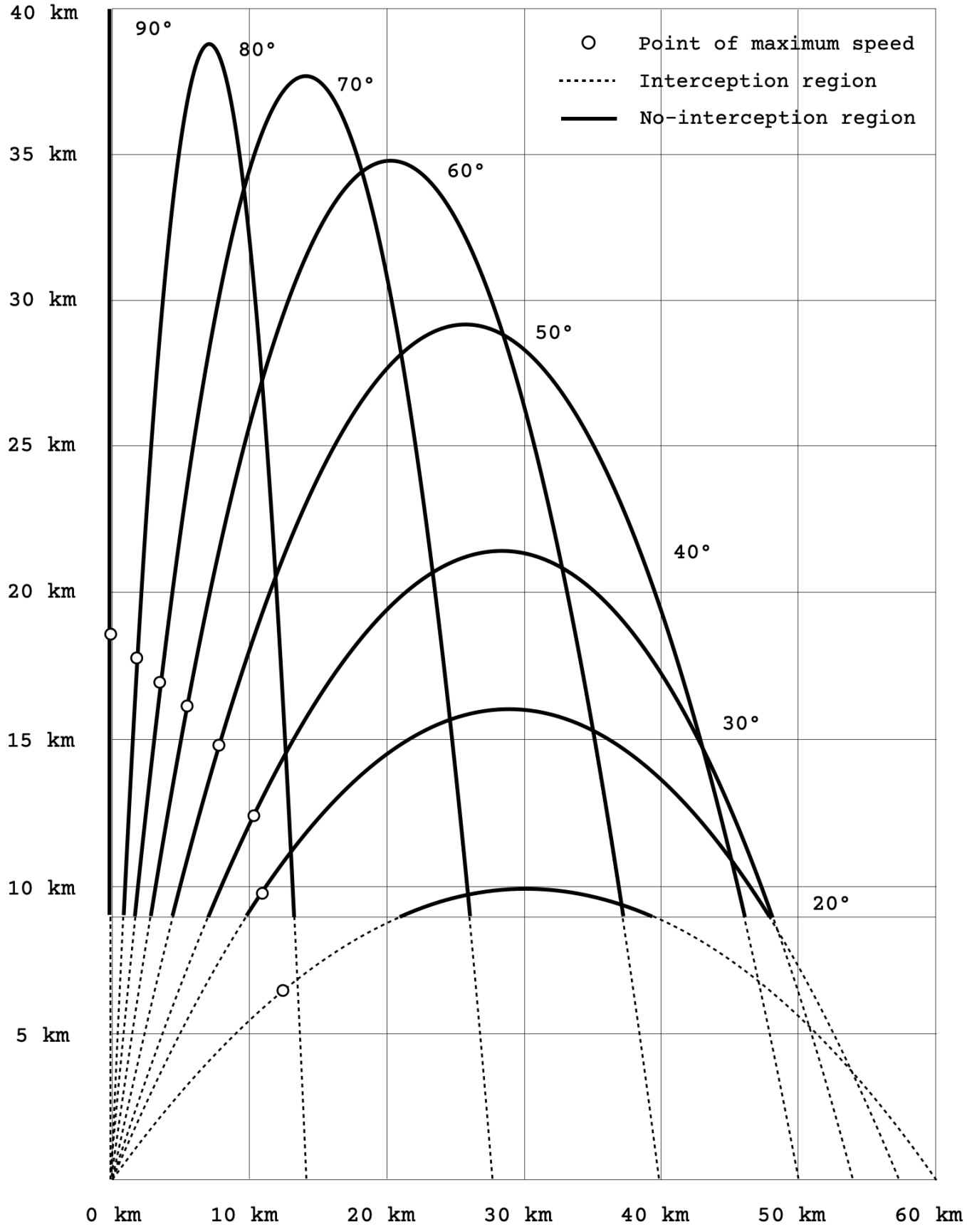


Fig.14 - Spyder, estimated interception envelope of CER-1200TR rocket.

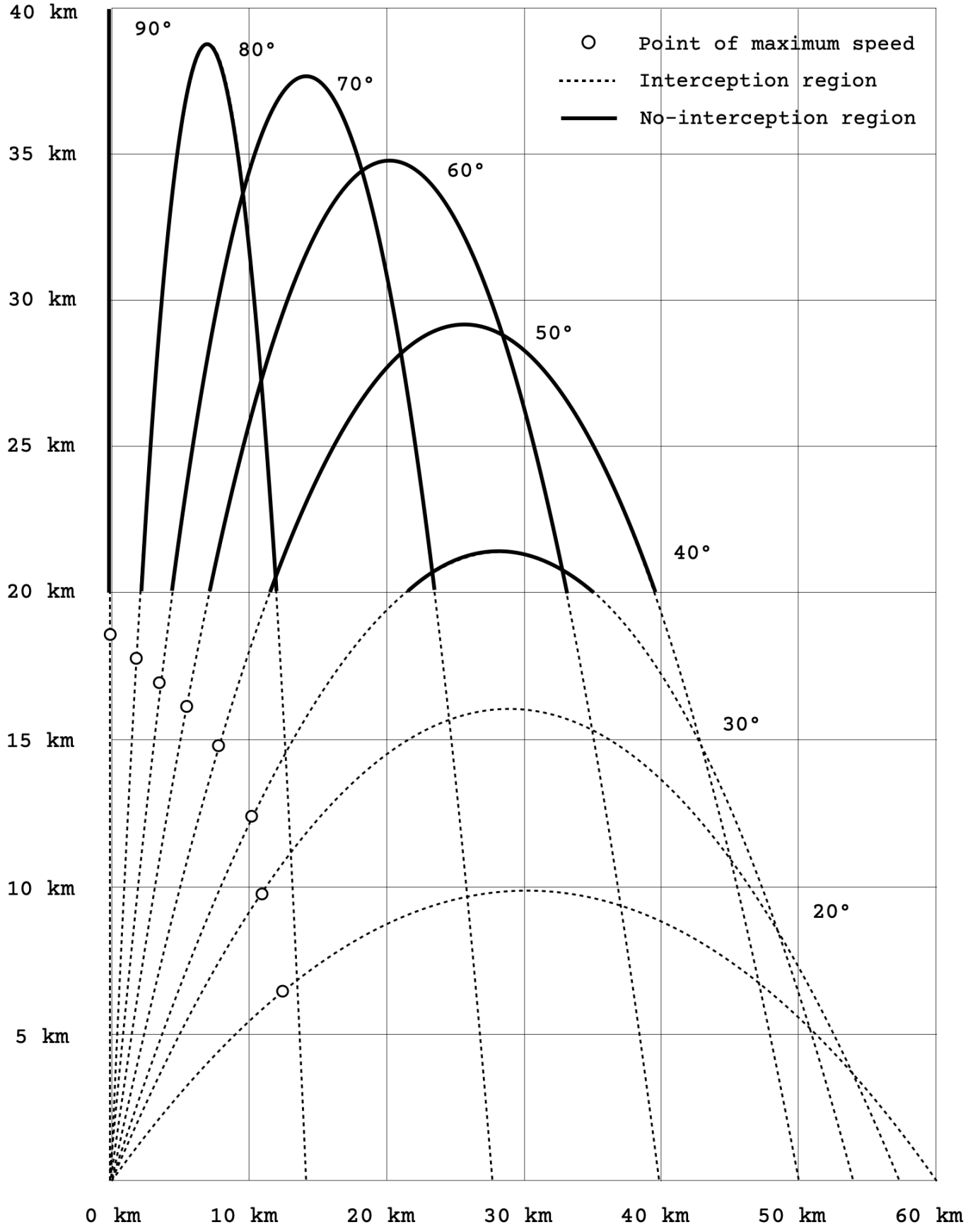


Fig.15 - MIM-23 - Hawk - Phase III, estimated interception envelope of CER-1200TR rocket.

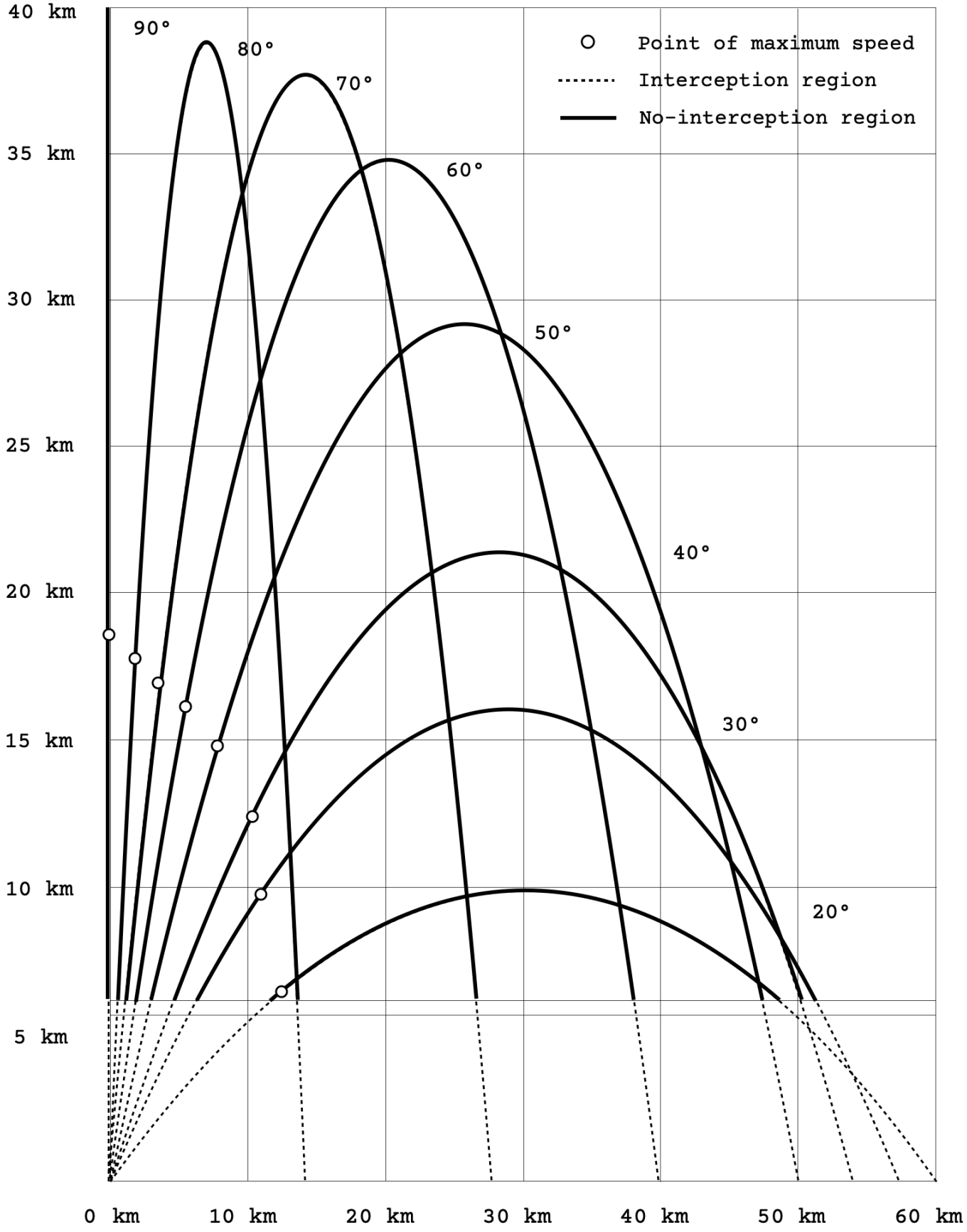


Fig.16 - Flakpanzer Gepard, estimated interception envelope of CER-1200TR rocket.

6. Launch options

The product can be launchd from:

- ground - in this case, the vehicle will be firmly fixed to the ground inside dedicated military launch ranges. The target vehicle could be placed in the same firing range as the interceptor, or in a different firing range.

- terrestrial vehicles - it will require a special order to fit the system on a vehicle. The multiple launcher configuration is also possible, allowing the operator to launch multiple targets at very short interval.

- from ships - taking into account the benign nature of rocket engine’s exhaust gases, the vehicle could be launched from the decks of naval ships. The ship that is intercepting could be the same that is launching the target. Also, a different ship than the one that is performing the interception could launch the target from a further distance.

- directly from the sea - the rocket could be launched directly from the sea, while being placed in the water by the ship that is performing the interception, or by a different ship.

6. Payload integration

The CER-1200TR vehicle has a detachable nose cone to allow the purchaser to accommodate the desired payload via the payload interface during the ground preparations for launch.
The 1200 mm diameter nose cone is available for the payload bay.
Although the rocket can fly without any avionics onboard, the payload space allows the integration of various equipment, such as telemetry hardware and optional Luneburg lens radar reflector for a specifically desired RADAR signature.
Another feature of the CER-1200TR is the capability to accommodate a Reentry Target Vehicle (RTV) or a Multiple Independent Reentry Target Vehicles (MIRTV) that transforms the rocket into a target able to simulate a SRBM/IRBM/MRBM/ICBM with separable warheads.

8. Prices

All prices are given in EURO. However, those who will pay in AMiE, ARCA Space's own crypto token will benefit from a 10% price discount.

8.1 Complete CER-1200TR system

Component	Price [€]	Price [€] if purchased in AMiE
CER-1200TR rocket	199,900	179,900
Launch canister	49,900	44,900
Transfer pump/accessories	9,900	8,900
Adjustable angle support*	89,900	80,900
TOTAL	349,600	314,600

* If the rocket will be launched exclusively vertical, the adjustable angle support might not be required.

NOTE: The price of additional options including painting for the rocket, launch canister, custom avionics, etc is not included in these prices.

8.2 Orders including more CER-1200TR rockets

For orders including more complete systems or rockets, discounts will apply.

9. Licensing

General Astronautics could license the product fabrication and sale to third parties, presumably a valid fabrication control and technology use is secured.

10. Order and Shipment

To place an order for the CER-1200TR system, send us an email at contact@arcaspace.com
The shipment will be made in standardised, 6m long containers. Each container could accommodate two CER-1200TR complete systems with one CER-1200TR rocket each.
The order will be ready for shipment depending on the order size. Usually for a complete CER-1200TR system, with a single rocket, the shipment will start 30 days after the payment was received.
For larger orders, the shipment date will be communicated before the payment.

11. Purchase eligibility

In general, a rocket falls into the category of a dual use product.
However, due to CER-1200TR's limited features, like the lack of guidance system, the use of liquid propellant leading to a long launch preparation time, and the engine's performance three to four times less than in the case of a regular military rocket, the product's application as a weapon and therefore as a dual use product is a non-realistic prospect.
However, we reserve the right to sale the product depending on our internal specific criteria.
Don't hesitate to contact us and we will promptly inform you if we can go forward with your purchase request.

12. FAQ

11.1 Operations

How difficult is to prepare the CER-1200TR system for launch?

The CER-1200TR system is very easy to operate and prepare for launch. Follow the instructions from the User Guide and Operation Manual that are provided together with the product and the process should be straightforward.

How difficult it is to mount the payload in a CER-1200TR rocket?

The CER-1200TR rocket came with a removable nose-cone and the access to the interface plate is made by unscrewing the bolts that are keeping the cone in place.

What propellant does the CER-1200TR system use?

The CER system uses a mixture of 30-70 water and hydrogen peroxide, commercially available as hydrogen peroxide 70%. A concentration of 50% is also an option but with a performance loss.

How much does the hydrogen peroxide 50% and 70% costs?

Depending on the region, for hydrogen peroxide 70% prices are between €1 to €2 per kg while for 50% concentration, prices are between €0.5 to €1 per kg.

How difficult is to procure hydrogen peroxide 70%?

The hydrogen peroxide 70% is commercially available and easy to procure in virtually any part of the world. 50% hydrogen peroxide is also available in stores.

How dangerous is hydrogen peroxide 50% and 70%?

You must avoid ingesting hydrogen peroxide 50-70% or getting in contact with your eyes and skin, by wearing googles and gloves during manipulation. In case of contact with your eyes and skin, always have fresh sweet closely available and apply abundent sweet water on the the contact region. The skin will become white on the contact region and it will regain the normal color in around two hours.
Please read carefully the Safety Data Sheet that will be provided with the product.

11.2 Features

Is it possible to mate the Reentry target Vehicle (RTV) with the CER-1200TR?

Yes, the CER-1200TR can accommodate one RTV as payload.

Is the CER-1200TR system reusable?

The CER-1200TR rocket is not reusable after flight. However, the launch canisters and the propellant transfer tanks as well as the accessories are reusable.

Is it possible to use the CER-1200TR system as weapon?

The lack of guidance system and any form of avionics onboard, as well as the use of liquid propellant leading to non-responsive operation, makes the CER-1200TR system a completely unsuitable option for military offensive use.

11.3 Launch approvals

Do I need a launch clearance for the CER-1200TR rocket?

It depends on what altitude do you plan to launch it and on the country on which you intend to launch it. The legislation may vary from country to country. We strongly advise you to contact your Military Aviation Authority, and seek guidance, prior to launch.

11.4 Eligibility

Who is eligible to purchase the CER-1200TR system?

In general, a rocket falls into the category of a dual use product.
However, due to CER-1200TR’s limited features and characteristics, like the lack of guidance system, the use of liquid propellant leading to a launch preparation time longer than in the case of regular military rockets and the engine’s performance three to four times less than in the case of a military rocket, the product’s application as a weapon and therefore as a dual use product is a non-realistic prospect.
In spite of this, we reserve the right to sale the product depending on our internal specific criteria.
If the purchaser’s country of origin is currently involved in combat activities, then the purchase request might be denied.
Please don’t hesitate to contact us and we will promptly inform you if we can go forward with your order.

11.5 Reservations and orders

How can I order the CER-1200TR system?

The CER-1200TR system will be available for purchase starting with March 2024. However, if you want to reserve one, you ca do it by placing a preorder at contact@arcaspace.com
The deliveries for the systems will be made in the order of reservations.

How long it will take until I'll receive my CER-1200TR system once ordered?

The order will be ready for shipment depending on the order size. Usually, for a complete CER-1200TR system, with a single rocket, the shipment will start 30 days after the payment was received. For larger orders, the shipment date will be communicated before the payment.

Can I get a refund after I placed an order for a CER-1200TR system?

Immediately after you placed an order and paid for a CER-1200TR system our company will start preparing and implementing the fabrication process and a refund will no longer be an option.

Will I a get a discount for a CER-1200TR system if paid with the AMiE token?

Yes, you will get a 10% discount if you'll pay for the ERC-160TR system with the AMiE Token.

What is the cost of delivery for the CER-1200TR system?

It depends on what region it needs to be shipped from Romania. For instance, for the delivery of an CER-1200TR system, to North America, the shipment costs around €19,000. For deliveries in Europe, the cost is significantly lower.

13. Legal considerations, risks disclaimer

PLEASE READ THE ENTIRETY OF THIS “Legal Considerations, Risks and Disclaimer” SECTION CAREFULLY.

The issuer is solely responsible for the content of this User Guide. This User Guide has not been reviewed or approved by any competent authority in any member state of the European Union. To the best knowledge of the issuer, the information presented in this User Guide is correct and complete without any significant omission.

The information shared in this User Guide is not all-encompassing or comprehensive and does not in any way intend to create a direct or indirect contractual relationship. The primary purpose of this User Guide is to provide potential product buyers with pertinent information so as to help them thoroughly analyse the CER-1200TR project and make an informed decision.

IF YOU ARE UNCERTAIN AS TO ANYTHING IN THIS USER GUIDE, WE STRONGLY URGE YOU NOT TO PURCHASE THE CER-1200TR PRODUCT.

14. Contact

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COSMOBAZA,
Stoenești, Romania

contact@arcaspace.com