Delprino Massimo & C. Snc

Via Cavassola Loc. Sanguineo – 17024 Finale Ligure (SV)

Impianto di stoccaggio e trattamento rifiuti inerti speciali non pericolosi

PROCEDURA DI VERIFICA-SCREENING VIA

L.R. 30.12.1998, n.38

STUDIO DI PREFATTIBILITA' AMBIENTALE Integrazione

Rev.	DESCRIZIONE	DATA EMISSIONE	
1	Integrazione richiesta Regione Liguria con lettera del 23/04/2014 (prot.n.PG/2014/0083204 (rif.S570- Class.Fasc. 2014/G13.17.1/5)	Maggio 2014	

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Commessa	Numero documento	
VIA-Scr		

integrazioni "geologia"

La presente relazione è redatta per approfondire alcuni aspetti così come richiesto dall a Regione Liguria ufficio VIA, rela tivamente all'istruttoria di verific a screening conness a al rinnovo dell'autorizzazione provinciale per l'impianto di recupero di rifiuti inerti esistent e sito in Finale Ligure (SV) loc. S anguineo con lettera del 23/04/201 4 Prot.n.PG/2014/0083204 (rif.S570- Class.Fasc. 2014/G13.17.1/5)

Geologia generale dell'area

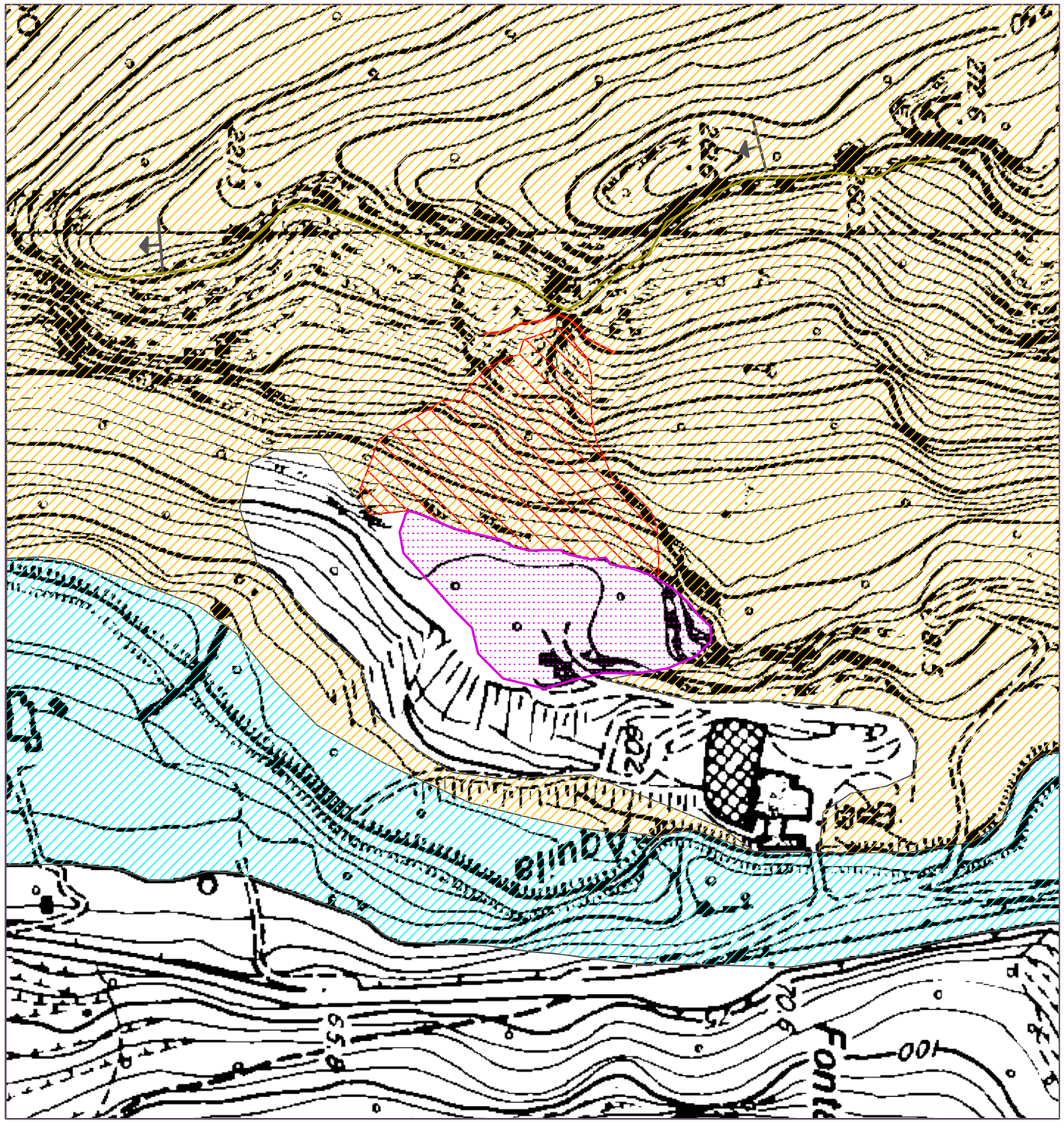
Dai rilevi eseguiti nella zona la situazione litologica è così caratterizzata:

- lungo l'asse vallivo e nel fondo valle fond ovalle del torrente Aquila il subs trato è rappresentato dalla formazione delle "dolomie di S.Pietro dei Monti", di età triassica;
- al di sopra sta la formazione della "Pietra di Finale";
- in fondovalle, in lembi discontinui, si hann o, in copertura, le alluvioni attuali del T.Aquila, mentre lungo i ver santi si hanno coperture detritiche anche di elevato/medio spessore, costitui te da accumuli a matrice sabbiosa e ghiaios a inglobante ciottoli e massi di variabilissima dimensione.

La formazione geologica che qui e ssenzialmente interessa e che costituisce in particolare le grandi dorsali che delimitano la valle dell'Aquila è quella del la "Pietra di Finale" di età miocenica. In particolare affiorano calcari bi oclastici a cemento calcitico di colore dal biancastro al rosato a stratificazione non s empre evidente con pres enza discontinua di lenti arenacce e conglomerati (membro di M.Cucco).

Sotto il profilo geomeccanico la Pietra di Fi nale presenta in generale discr eta tenacità e compattezza ed una fratturazione relativam ente scarsa, dando luo go ad imponenti pareti verticali che possono superare anche i 200 metri. Essa può dar luogo a importanti frane di crollo per erosione al pie de del versante o per la pres enza di "incarismento", con formazione alla base delle pareti di materassi detritici a spigoli vivi ed elevato angolo d'attrito.

CARTA GEOLOGICA e GEOMORFOLOGICA



LEGENDA

Alluvioni recenti

Riporto

Superficie Piazzale

Pietra del Finale, calcari bioclastici a cemento calcitico di colore dal biancastro al rosato a stratificazione non sempre evidente (giacitura media: N 70-190/5°-10°).

Giacitura strati

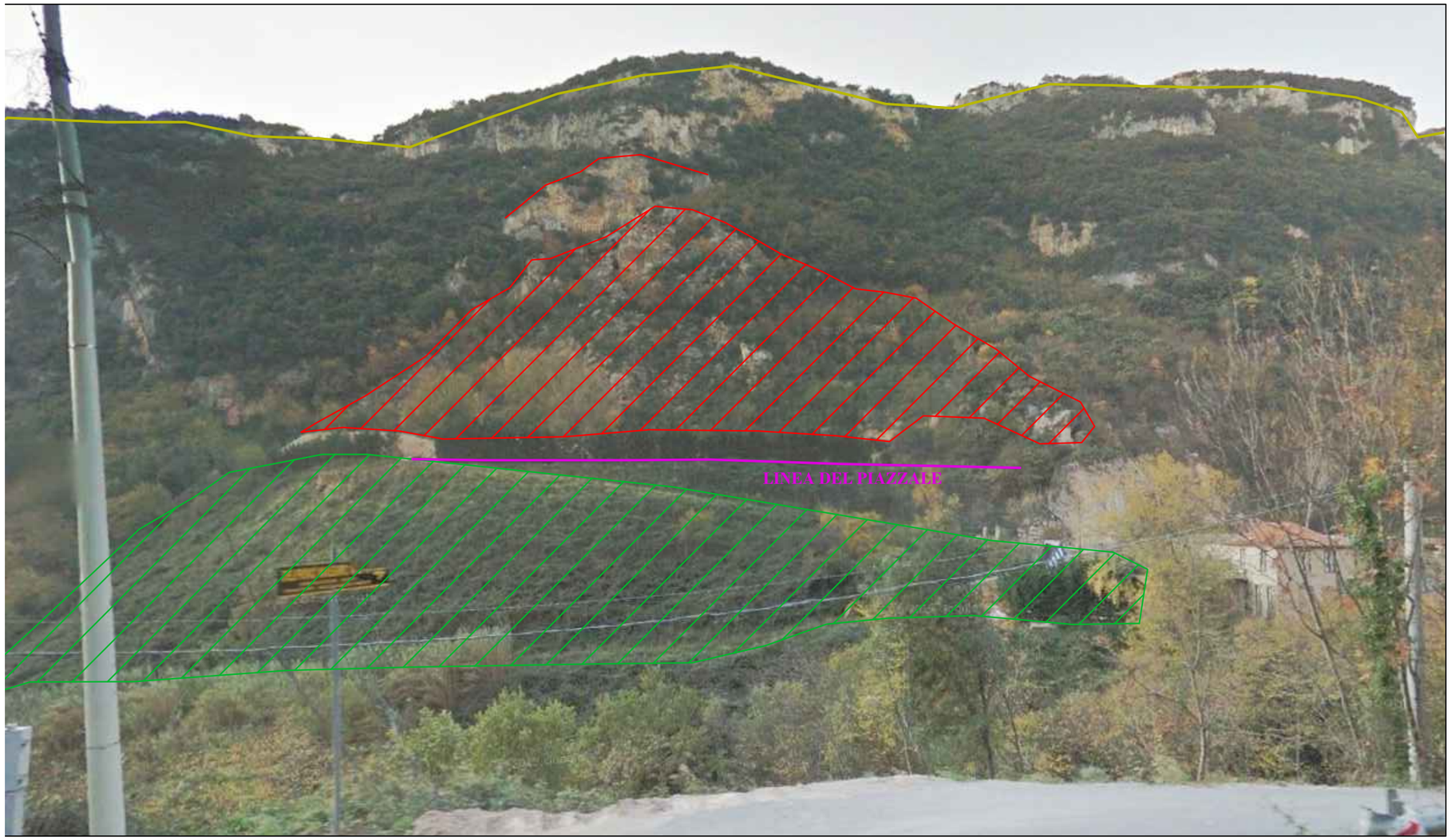
Ciglio di distacco antica frana

Corpo di frana costituito da un accumulo di massi di Pietra del Finale a varia pezzatura mutuamente incastrati

Orlo parete rocciosa di Pietra del Finale

SCALA 1:2000

"RENDERING AL VERO"CON INDICAZIONE DEI PRINCIPALI PARAMETRI GEOLOGICI E GEOMORFOLOGICI DELL'AREA "SCOGLI ROTTI"



LEGENDA

Riporto

Ciglio di distacco antica frana

Corpo di frana cost da accumulo di ma Pietra del Finale a pezzatura mutuam incastrati

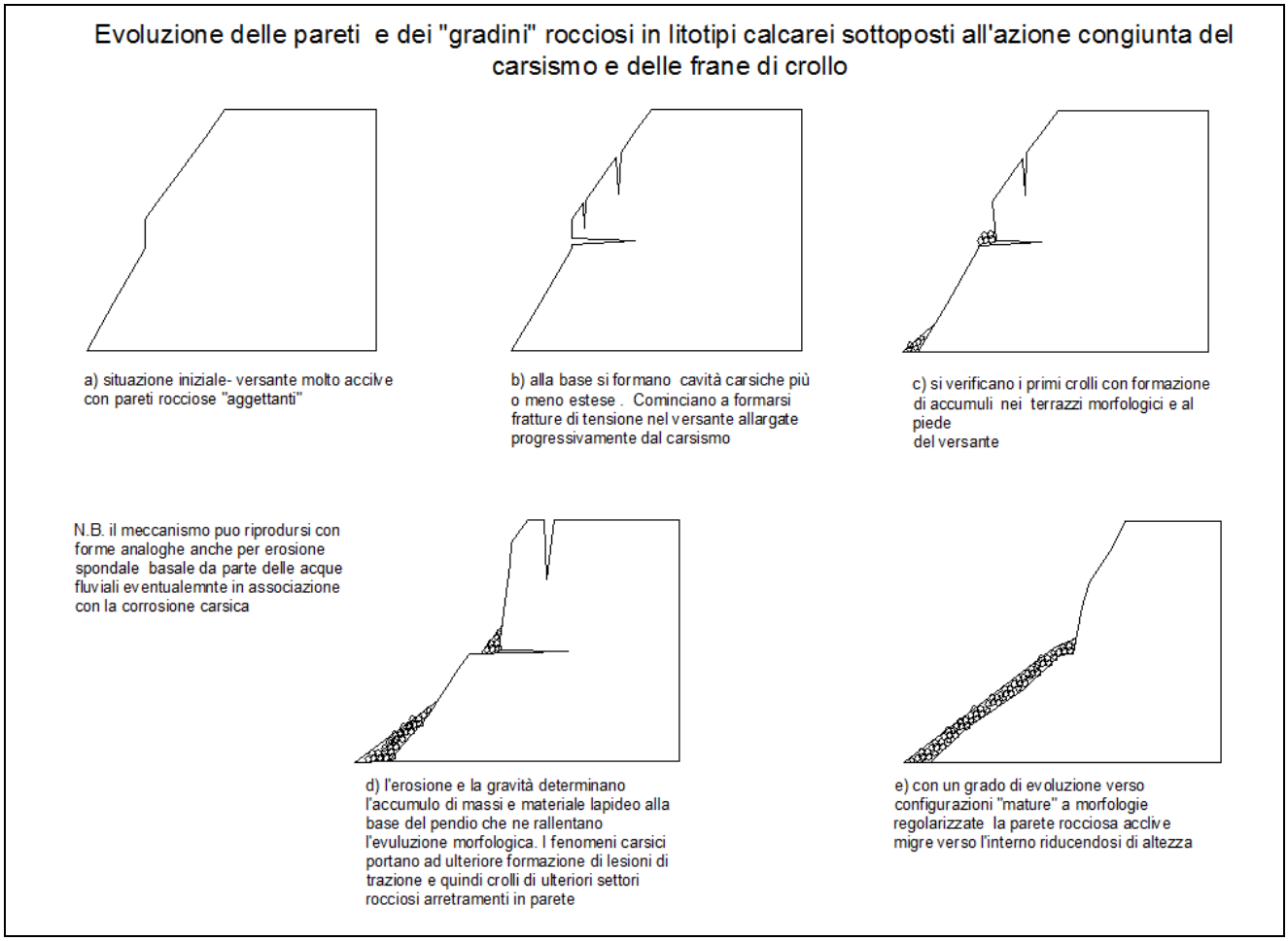
Orlo parete roccios Pietra del Finale

sviluppo piazzale

Dinamica dei versanti, rilievi geostrutturali e geomorfologici dell'area di frana denominata "Scogli Rotti".

La "pietra" si presenta nel versante in grandi bancate, sub-orizzontali o con debole inclinazione (N° 170-190 / 5°-10°), interessata da un rado sistema di fratturazione verticali ed ortogonali tra loro, nonché da importanti fenomenologie carsiche. In particolare la formazione costituisce il corpo della dorsale in destra orografica della valle dell'Aquila, dorsale da cui ha avuto origine la frana di crollo che ha formato l'accumulo posto immediatamente a monte del piazzale delle lavorazioni della ditta Delprino.
L'elemento caratterizzante della zona è rappresentato da un antico corpo di frana risalente al XVIII secolo e già descritto dal geografo genovese Matteo Vinzoni, oggi a grandi linee stabilizzato nelle sue complessive dimensioni. Il fenomeno ha prodotto un elevato accumulo di materiali lapidei di grosse dimensioni, migrati dai fronti sub-verticali in "pietra di Finale", presenti più a monte; l'accumulo inoltre ha chiaramente influito sull'assetto dell'asta del torrente spostandola verso sinistra. I materiali dell'accumulo sono poi stati per lungo tempo oggetto di escavazione fino ai primi anni 70 per la realizzazione del porto di Finale. Nel suo insieme l'antico accumulo di frana giunge praticamente fino a fondovalle, ma la porzione inferiore, quella a valle del piazzale di lavoro, è abbondantemente stabilizzata e mascherata dai riporti artificiali che si sono verificati periodicamente lungo le sue pendici, fino a costituire la scarpata oggi visibile a valle del piazzale.
L'accumulo di frana, a monte del piazzale in questione, si presenta oggi su un fronte molto acclive con una pendenza media intorno al 100% tra la quota 82m (piazzale) e la quota di circa 130 m per poi continuare con un andamento a "dosso" secondo pendenze più limitate fino a raggiungere sulla cornice superiore del versante la parete rocciosa sub-verticaleggiante in "posto" che testimonia l'originaria nicchia di frana.
La ricostruzione dei fenomeni che hanno portato allo sviluppo del moto franoso sono legati alla morfogenesi dei versanti impostati nella "Pietra del Finale" con versanti "gradonati" con piccoli "pianori" intervallati a scarpate intermedie sub-verticali di varia altezza.
L'evoluzione di queste forme è dovuta all'azione concomitante dei processi gravitativi e carsici. Le pareti rocciose arretrano per crolli successivi con un innalzamento progressivo della quota della parete che si riduce in altezza ma si mantiene sub-verticale.
Importante in questo meccanismo è la questione del "carsismo" che corrisponde a successivi abbassamenti del livello di base carsico che fa si che le pareti rocciose siano concentrate per quote che non corrispondono a particolari orizzonti stratigrafici. Il livello

“incarsito” comporta lo sviluppo di cavità e condotti più o meno intercomunicanti che innescano i processi di crollo. Altro motivo di evoluz ione può essere legat o all’erosione selettiva basale da parte del corso d’acqua nel fondovalle.



L’antico corpo di frana è costituito da un insiem e caotico di elementi lapidei calcarei di varia dimensione anc he con massi plurimetrici di forma vari a ma piuttosto “squadra ta” e spigoli “vivi”. Nel suo insieme l’accumulo è stabilizzato, vista la natura e pezzatura dei massi e dei reciproci mutui incastri tra gli stessi con una pendenza complessiva di c irca 45° che appare congruente con i valori di “ natural declivio” dei materiali granulari grossolani. Non poss ono tuttavia escludersi, almeno in via teor ica, soprattutto nelle z one più acclivi crolli (pe r ribaltamento o sc orrimento planare) d i massi c he possono scoscendere a valle.

Pertanto più che es eguire un rilievo ge omeccanico della par ete rocciosa (peraltro in posizione decisamente arretrata rispetto al piazzale in questione) si cercato di individuare un modello coerente per l’indiv iduazione dei meccanismi di dist acco e delle volumetrie dei materiali eventualmente instabili.



Piazzale di lavorazione e accumulo di frana superiore



Particolare del vallo che si interpone tra il versante (accumulo di frana) e il piazzale di lavorazione

Alla luce delle considerazioni sopra elencate è stato, valutato, dal lo scrivente, che gli eventuali fenomeni di crollo che possono in via teorica interessare il piazzale di lavorazione (il titolare dell'attività afferma tuttavia che da quando insediata l'attività negli anni 90 non sono si sono verificati crolli di massi che abbiano coinvolto il piazzale stesso) sono quelli provenienti dalla parte più superficiale dell'accumulo di massi che costituiscono l'antico corpo di frana. E' stato eseguito un esame sulle pezzature del materiale roccioso costituente l'accumulo ed in particolare i massi posti in prossimità del "ciglio" del piazzale a ridosso del "vallo" esistente ritenendo che gli stessi possano rappresentare possibili testimoni di precedenti fenomeni di crollo.

La scelta del masso "tipo" è avvenuta sulla scorta delle osservazioni eseguite in loco assimilando ad elemento "a sfera" di diametro di 3 m con un peso dell'elemento di circa 33.000 kg valore che risulta "cautelativo" nel contesto esaminato.

E' stato eseguito uno studio riguardante la "caduta massi" con il programma GEOROK 2D dove i calcoli hanno permesso di valutare le "energie di rilievo" ed ipotizzare la "traiettoria" di caduta dei volumi rocciosi considerati e quindi definire gli scenari .

Il moto di caduta di un blocco roccioso lungo una scarpata rocciosa dipende da numerosi fattori che non è facile esprimere numericamente. Le traiettorie dei blocchi dipendono dalla geometria della scarpata, dalla forma del blocco in caduta e dalla sua velocità iniziale al momento del distacco dal pendio, ed inoltre dall'entità dell'energia dissipata per effetto degli urti durante la caduta. I blocchi in caduta possono, infatti, scivolare, rotolare o rimbalzare a valle secondo la loro forma, appiattita o arrotondata, e dell'inclinazione del pendio e dagli ostacoli incontrati. L'energia dissipata per effetto degli urti è in genere diversa al variare delle caratteristiche del moto e dipende dalle caratteristiche meccaniche del blocco e dai materiali presenti lungo la scarpata (roccia, detrito, terreno, vegetazione) che si oppongono in misura differente al moto dei blocchi. Nella realtà, tuttavia, è in pratica impossibile determinare puntualmente il profilo di un pendio ed individuare la forma dei diversi blocchi che potrebbero distaccarsi. Inoltre la geometria del pendio e la natura dei materiali affioranti subiscono nel tempo modifiche, anche sensibili, per effetto, dell'alterazione della roccia, per l'accumulo di detriti nelle zone meno acclivi e per lo sviluppo della vegetazione. Infine diviene praticamente impossibile modellare il moto di caduta dei blocchi nei casi in cui questi si frantumino per effetto degli urti, né è possibile individuare le zone del pendio in cui si verifica la frantumazione.

Per l'analisi delle traiettorie di caduta è necessario fare riferimento a modelli semplificati e

la progettazione geotecnica degli interventi di protezione deve essere sviluppata sulla base di un'ampia sperimentazione numerica, che consenta di indagare sui diversi aspetti del fenomeno e riconoscere i fattori principali che influenzano il moto di caduta nella particolare situazione in esame.

Si utilizza nel caso il metodo di calcolo CRSP (Colorado Rockfall Simulation Program). Esso è stato messo a punto da Pfeiffer e Bowen (1989) con lo scopo di modellare il moto di caduta di blocchi aventi la forma di sfere, cilindri o dischi, con sezione circolare nel piano verticale del movimento. E' stato utilizzato allo scopo di analizzare le traiettorie di caduta dei massi ed è in grado di fornire analisi statistiche della velocità, dell'energia cinetica e dell'altezza dei rimbalzi in diversi punti della scarpata.

Per descrivere il movimento dei blocchi il modello CRSP applica l'equazione del moto parabolico di un corpo in caduta libera ed il principio di conservazione dell'energia totale.

In particolare il modello CRSP assume che l'angolo formato tra la direzione del blocco ed il profilo del pendio vari secondo una statistica che deve essere definita per ogni caso analizzato. Il modello tratta quindi in modo statistico anche i risultati che principalmente constano nelle velocità e nelle altezze di rimbalzo, rispetto alla superficie del pendio, durante il percorso di caduta. Il modello considera quindi le combinazioni dei movimenti di caduta libera, di rimbalzo, di rotolamento e di scivolamento, che possono variare secondo le dimensioni dei blocchi e della rugosità del pendio.

L'affidabilità del modello è stata verificata attraverso numerosi confronti tra i risultati numerici e quelli ottenuti da prove in sito. La descrizione del moto di caduta libera inizia da un punto nel quale, è nota la velocità iniziale scomposta nelle sue componenti orizzontali e verticali. Il blocco è soggetto al movimento di caduta libera fino a quando non collide con la superficie del pendio. Dall'intersezione sono ricavate le coordinate del punto di impatto. Il vettore della velocità di pre-impatto forma un angolo con il pendio.

Ad ogni impatto l'inclinazione del pendio è fatta variare casualmente in un campo di valori compreso tra 0 ed un valore funzione della rugosità del pendio e dalla dimensione del blocco. La velocità che si ottiene a seguito dell'impatto, viene determinata attraverso l'equazione di conservazione dell'energia totale così espressa:

$$\left(\frac{1}{2}J\varpi_1^2+\frac{1}{2}MV_{t1}^2\right)\times f(F)\times SF=\frac{1}{2}J\varpi_2^2+\frac{1}{2}MV_{t2}^2 \qquad (1)$$

dove:

M = *Massa del blocco;*

J = *Momento d'inerzia del blocco;*

ω_1 = *Velocità angolare prima dell'impatto;*

ω_2 = *Velocità angolare dopo l'impatto;*
V_{t1} = *Velocità tangenziale prima dell'impatto;*
V_{t2} = *Velocità tangenziale dopo l'impatto;*

La funzione *f(F)* di attrito così definita:

$$f(F) = SF + \frac{(1 - R_t)}{\left[\left(\frac{V_{t1} - \varpi_1 \times R}{20}\right)^2 + 1.2\right]}$$

Mentre la funzione di scala *SF*:

$$SF = \frac{R_t}{\left[\left(\frac{V_{n1}}{250 \times R_n}\right)^2 + 1\right]}$$

Dove:
R_n = *Coefficienti di restituzione normale;*
R_t = *Coefficienti di restituzione tangenziale;*
R = *Raggio del blocco;*

I termini f(F) e SF sono ricavabili attraverso espressioni empiriche che vengono utilizzate per valutare l'energia cinetica dissipata nelle collisioni tra blocco e pendi o a causa dell'attrito e dell'urto.
L'attrito riguarda principalment e la dissipazione dell'e nergia prodotta dalla velocità tangenziale, l'urto quella prodotta dalla velocità normale al pendio.
Le velocità tangenziali e angolar i post-collisione sono messe in relazione tra loro dalla seguente equazione:

$$V_{t2} = \omega_2 \times R$$

che assume che i blocchi abbandonino il c ontatto con il pendio ruotando, indipendentemente dalla velocità angolare precedente.
Dalla (1) si ottiene Vt2, mentre la velocit à normale post-collis ione viene ricavata dalla seguente espressione empirica:

$$V_{n2} = V_{n1} \times \frac{R_n}{\left[1 + \left(\frac{V_{n1}}{9}\right)^2\right]}$$

che intende tener conto del fatto, verificato anche sperimentalmente, che il rapporto tra le velocità normali post-impatto e pre-impatto diminuisce con l'aumentare della velocit à normale pre-impatto stessa.

Alla base del pendio addossato a llo stesso si “interpone” un “v allo” in terra che funge da difesa al sottostante piazzale di lavorazione. Esso è costit uito da un “terrapieno” a forma trapezoidale di altezza di circa 12 m che risult a compatibile con gli scenari determinati di rischio in loco in una ottica mitigativa.

Vengono riportate in alle gato le simulazioni trai ettografiche sulla sezi one di riferimento a monte del piazzale con diverse configurazioni sia con la presenza del solo terrapieno che costituisce il già citato “vallo” sia con la presenza dei cumuli di materiale M.P.S. che la ditta Delprino accatas tata nell’ambito delle lavorazioni a tergo del vallo s tesso e ch e costituiscono un ulteriore elemento di rinforzo al vallo esistente.

Le simulazioni traiettografiche eseguite derivano da analisi statistiche e pertanto risultano, rispetto ai fenomeni di crollo reale in parete, approssimate soprattutto in caso di event i eccezionali o particolari che potrebbero por tare a situazion i diverse da quanto qui previsto.

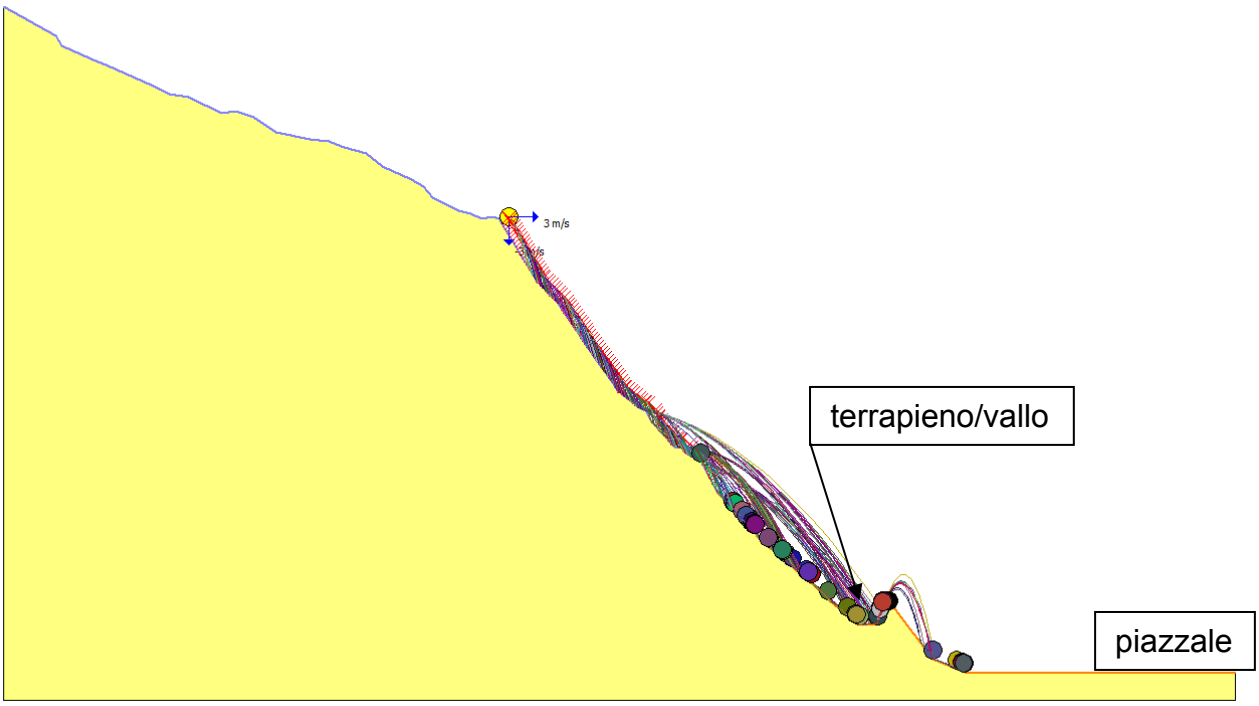
Si può comunque concludere che dai dati di calcolo la presenza del “vallo” è un efficace provvedimento per la mitigazione del rischio geomorfologico rappresentato dalla “caduta” di massi .

Ulteriore sicurezza è fornita dalla configurazione del piazzale in relazione alle lavorazioni qui eseguite che portano ad addossare al vallo grandi cumuli di materiale M.P.S.

Molto importante risulta ovvi amente la periodica manutenz ione del “vallo” al fine di garantirne nel tempo la funzional ità e l’efficienza dello stesso per fronteggiare i pericoli di crolli

Si ricorda che il vallo ha fina lità di “mitigazione” del rischio idrogeologico e si consiglia pertanto di attuare misure di prevenzione tramite l’adozione di provvedimenti collegati alla Protezione Civile con particolare riferimento alle fasi “allerta” idro-metereologiche regionali con il divieto di eseguire lavora zioni nel piazzale durante le fasi allerta di tipo “2” o durante piogge particolarmente intense e di eseguire un c ontrollo periodico a “vista” dello stat o dell’accumulo a monte e in ogni caso dopo avvenimenti calamitosi.

Simulazione “traiettografica” A



CARATTERISTICHE DEL BLOCCO

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Forma del blocco	Sferico
Densità	2400,0 Kg/m³
Elasticità	28635000,0 kPa
Velocità iniziale in x	3,0 m/s
Velocità iniziale in y	-3,0 m/s
Velocità limite di arresto	0,01 m/s
Diametro	3,0 m

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Massa	33929,2 Kg
Peso	33929,2 Kgf
Momento d'inerzia	30536,28 Kgxm2

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Elenco materiali

N	Descrizione	Rn	Rt	Texture
1	Roccia integra	0,9	0,8	
2	Roccia alterata	0,7	0,7	
3	Sabbia	0,4	0,6	
4	Detrito	0,6	0,6	
5	Detrito fino	0,32	0,82	
6	Detrito vegetato	0,29	0,8	
7	Detrito con arbusti	0,3	0,7	
8	Terreno o prato	0,31	0,79	
9	Superficie pavimentata	0,4	0,9	

DATI PENDIO

N	X (m)	Y (m)	Materiale
1	-211,39	123,9	Roccia alterata
2	-202,71	118,6	Roccia alterata
3	-201,6	116,85	Roccia alterata
4	-195,56	113,96	Roccia alterata
5	-194,35	113,37	Roccia alterata
6	-186,65	109,82	Roccia alterata
7	-183,69	108,16	Roccia alterata
8	-180,52	107,71	Roccia alterata
9	-174,9	104,77	Roccia alterata
10	-172,54	105,26	Roccia alterata
11	-169,52	104,05	Roccia alterata
12	-165,91	101,44	Roccia alterata
13	-160,18	100,21	Roccia alterata
14	-156,94	99,89	Roccia alterata
15	-154,46	98,79	Roccia alterata
16	-150,82	97,67	Roccia alterata
17	-148,02	95,27	Roccia alterata
18	-143,29	92,95	Roccia alterata
19	-141,25	91,65	Roccia alterata
20	-139,74	89,73	Roccia alterata
21	-135,26	87,5	Roccia alterata
22	-133,29	86,92	Roccia alterata
23	-131,52	85,96	Roccia alterata
24	-129,62	86,35	Roccia alterata
25	-128,53	86,07	Roccia alterata
26	-122,42	75,02	Roccia alterata
27	-118,78	71,02	Roccia alterata
28	-112,64	61,25	Roccia alterata
29	-109,54	56,72	Roccia alterata
30	-108,76	55,35	Roccia alterata
31	-105,14	52,24	Roccia alterata
32	-104,04	51,8	Roccia alterata
33	-103,03	49,77	Roccia alterata
34	-99,17	45,28	Roccia alterata
35	-98,05	45,06	Roccia alterata
36	-97,37	44,17	Roccia alterata
37	-94,9	42,67	Roccia alterata
38	-94,32	41,88	Roccia alterata
39	-93,38	39,72	Roccia alterata
40	-92,01	37,08	Terreno o prato
41	-84,7	28,62	Terreno o prato
42	-75,82	20,56	Terreno o prato
43	-73,54	17,99	Terreno o prato
44	-68,31	13,5	Terreno o prato
45	-65,27	13,68	Terreno o prato
46	-64,34	16,29	Terreno o prato
47	-62,37	16,35	Terreno o prato
48	-55,95	7,4	Terreno o prato
49	-50,27	4,89	Terreno o prato
50	-5,44	4,96	Terreno o prato

IMPATTO

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Lancio n°1 Xp=-126,96 m yp=86,33 m

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Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)

==========

1,0	-123,73	77,396	6,877	-7,603	1,078	3339,388
2,0	-120,76	73,198	9,308	-7,55	0,432	3856,359
3,0	-108,851	55,509	9,743	-14,386	1,279	9276,619
4,0	-108,725	55,321	14,197	-8,799	0,013	7221,603
5,0	-95,75	43,184	17,464	-6,887	0,914	10620,22
6,0	-64,661	15,38	2,77	10,534	1,78	17556,9
7,0	-57,434	9,47	8,231	-9,179	2,609	4779,172
8,0	-55,669	7,276	11,094	-3,42	0,214	4328,397
9,0	-52,288	5,778	11,262	-4,536	0,305	3686,642
10,0	-51,247	5,317	11,182	-4,814	0,092	3653,443
11,0	-50,927	5,175	11,023	-4,84	0,029	3567,371
12,0	-50,83	5,132	10,84	-4,789	0,009	3456,412

Lancio n°2 Xp=-126,67 m yp=85,8 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-123,439	76,871	6,877	-7,603	1,078	3339,385
2,0	-120,82	73,264	9,034	-7,518	0,381	3659,701
3,0	-110,247	57,744	10,988	-12,48	1,17	8427,97
4,0	-107,4	54,182	14,526	-9,279	0,259	7724,31
5,0	-104,117	51,834	16,848	-3,681	0,226	7797,092
6,0	-64,449	15,977	3,042	11,28	2,354	18945,75
7,0	-55,591	7,242	8,627	-2,427	2,911	6143,703
8,0	-53,137	6,155	8,829	-3,487	0,284	2258,281
9,0	-52,374	5,816	8,786	-3,761	0,086	2251,783
10,0	-52,138	5,712	8,666	-3,799	0,027	2203,908
11,0	-52,067	5,68	8,524	-3,764	0,008	2137,022

Lancio n°3 Xp=-126,38 m yp=85,28 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-123,148	76,346	6,877	-7,603	1,078	3339,388
2,0	-120,935	73,39	8,703	-7,487	0,322	3443,027
3,0	-111,612	59,741	10,502	-12,027	1,071	7659,415
4,0	-107,481	54,252	14,583	-8,916	0,393	7857,866
5,0	-85,253	29,266	15,588	-16,27	1,524	15204,24
6,0	-84,358	28,316	16,889	-14,551	0,057	12365,48
7,0	-81,634	25,841	16,84	-15,054	0,161	12624,58
8,0	-80,795	25,079	16,627	-15,03	0,05	12370,49
9,0	-80,539	24,846	16,361	-14,84	0,015	12008,79
10,0	-80,461	24,776	16,08	-14,601	0,005	11611,34

Lancio n°4 Xp=-126,09 m yp=84,75 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)

Lancio n°5 Xp=-125,8 m yp=84,23 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-122,567	75,296	6,877	-7,603	1,078	3339,385
2,0	-121,569	74,089	7,627	-7,411	0,145	2860,876
3,0	-120,015	72,376	7,952	-8,073	0,204	3252,993
4,0	-118,887	71,133	8,119	-8,467	0,142	3462,415
5,0	-111,82	60,045	10,173	-11,616	0,871	6957,685
6,0	-107,558	54,318	14,285	-8,627	0,419	7546,038
7,0	-86,001	30,13	15,303	-15,954	1,509	14612,61
8,0	-84,141	28,119	16,838	-14,356	0,122	12267,85

9,0	-80,912	25,185	16,829	-14,998	0,192	12602,0
10,0	-79,917	24,281	16,632	-15,02	0,059	12369,66
11,0	-79,613	24,005	16,371	-14,844	0,018	12019,96
12,0	-79,52	23,92	16,092	-14,61	0,006	11626,59

Lancio n°6 Xp=-125,51 m yp=83,7 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-122,305	74,901	8,355	-4,646	1,068	3296,18
2,0	-109,955	57,317	10,766	-11,65	1,478	7959,457
3,0	-107,188	54,0	13,846	-8,959	0,257	7044,431
4,0	-104,273	51,896	16,133	-3,451	0,211	7126,014
5,0	-65,001	14,428	3,149	11,621	2,434	18884,64
6,0	-55,972	7,432	8,924	-10,093	2,867	5765,964

Lancio n°7 Xp=-125,22 m yp=83,18 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-122,075	74,648	8,278	-4,587	1,048	3205,881
2,0	-109,835	57,142	10,735	-11,58	1,479	7890,915
3,0	-107,213	54,021	13,724	-8,927	0,244	6923,671
4,0	-104,304	51,908	16,029	-3,401	0,212	7037,136
5,0	-65,078	14,209	3,164	11,671	2,447	18873,59
6,0	-56,04	7,525	8,899	-10,068	2,856	5691,381
7,0	-55,917	7,386	11,539	-3,718	0,014	4321,93
8,0	-52,638	5,933	11,676	-4,749	0,284	3963,297
9,0	-51,629	5,486	11,581	-5,0	0,086	3921,181
10,0	-51,319	5,349	11,412	-5,015	0,027	3824,755
11,0	-51,225	5,307	11,221	-4,959	0,008	3704,371

Lancio n°8 Xp=-124,93 m yp=82,65 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-121,846	74,395	8,199	-4,528	1,027	3115,127
2,0	-109,727	56,984	10,699	-11,506	1,478	7816,418
3,0	-107,24	54,044	13,601	-8,893	0,232	6804,434
4,0	-104,334	51,92	15,923	-3,351	0,214	6947,655
5,0	-65,158	13,984	3,18	11,721	2,46	18863,85
6,0	-56,109	7,623	8,873	-10,041	2,845	5614,548
7,0	-55,894	7,376	11,532	-3,707	0,024	4333,926
8,0	-52,597	5,915	11,67	-4,744	0,286	3959,644
9,0	-51,582	5,466	11,576	-4,997	0,087	3917,855
10,0	-51,271	5,328	11,407	-5,013	0,027	3821,737
11,0	-51,176	5,285	11,217	-4,957	0,008	3701,539

Lancio n°9 Xp=-124,64 m yp=82,13 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-121,619	74,145	8,116	-4,469	1,006	3023,889
2,0	-109,632	56,845	10,659	-11,428	1,477	7735,662
3,0	-107,266	54,067	13,478	-8,855	0,222	6687,223
4,0	-104,363	51,932	15,816	-3,301	0,215	6857,665
5,0	-65,24	13,754	3,196	11,773	2,474	18855,73
6,0	-56,182	7,724	8,845	-10,012	2,834	5535,408
7,0	-55,871	7,366	11,522	-3,694	0,035	4345,495
8,0	-52,557	5,897	11,663	-4,738	0,288	3954,778
9,0	-51,537	5,446	11,57	-4,993	0,087	3913,335

10,0	-51,224	5,307	11,401	-5,01	0,027	3817,559
11,0	-51,128	5,264	11,211	-4,954	0,008	3697,58

Lancio n°10 Xp=-124,35 m yp=81,6 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-121,393	73,896	8,031	-4,41	0,985	2932,138
2,0	-109,55	56,725	10,614	-11,345	1,475	7648,331
3,0	-107,29	54,088	13,356	-8,813	0,213	6572,584
4,0	-104,39	51,943	15,708	-3,252	0,217	6767,263
5,0	-65,41	13,668	10,142	1,401	2,482	18799,56
6,0	-65,264	13,687	0,337	5,154	0,014	2478,417
7,0	-64,975	14,499	0,732	3,33	0,858	349,74
8,0	-64,785	15,033	0,322	1,774	0,26	97,088
9,0	-64,728	15,193	0,22	0,91	0,177	23,25

Lancio n°11 Xp=-124,06 m yp=81,08 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-121,168	73,648	7,942	-4,35	0,962	2839,83
2,0	-109,453	56,558	9,095	-12,608	1,475	7576,428
3,0	-108,415	55,055	13,243	-8,055	0,114	6222,165
4,0	-96,207	43,461	16,537	-6,33	0,922	9521,704
5,0	-65,089	14,18	2,848	10,816	1,882	17124,99
6,0	-57,869	10,077	8,01	-8,96	2,535	4330,643
7,0	-55,699	7,289	10,945	-3,334	0,271	4347,103
8,0	-52,319	5,792	11,121	-4,468	0,309	3594,492
9,0	-51,279	5,331	11,045	-4,752	0,094	3563,77
10,0	-50,959	5,189	10,888	-4,78	0,029	3480,779
11,0	-50,861	5,146	10,708	-4,73	0,009	3372,847

Lancio n°12 Xp=-123,77 m yp=80,55 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)

Lancio n°13 Xp=-123,47 m yp=80,03 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-120,725	73,159	7,753	-4,23	0,917	2653,394
2,0	-109,324	56,333	9,037	-12,416	1,47	7395,742
3,0	-108,448	55,083	13,005	-7,962	0,097	5998,384
4,0	-96,514	43,647	16,335	-6,208	0,918	9288,235
5,0	-65,234	13,773	2,88	10,916	1,915	17128,51
6,0	-58,005	10,267	7,93	-8,884	2,51	4187,98
7,0	-55,72	7,299	10,886	-3,303	0,288	4344,902
8,0	-52,348	5,805	11,064	-4,441	0,31	3557,657
9,0	-51,309	5,345	10,99	-4,727	0,094	3527,851
10,0	-50,99	5,203	10,834	-4,756	0,029	3446,023
11,0	-50,892	5,16	10,655	-4,707	0,009	3339,278

Lancio n°14 Xp=-123,18 m yp=79,5 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-120,505	72,917	7,652	-4,169	0,893	2559,175
2,0	-109,295	56,283	8,993	-12,306	1,465	7284,326
3,0	-108,453	55,088	12,895	-7,907	0,094	5896,296

4,0	-96,634	43,719	16,239	-6,149	0,917	9178,592
5,0	-65,351	13,671	11,043	1,516	1,926	17094,87
6,0	-65,266	13,682	0,463	5,459	0,008	2941,538
7,0	-64,874	14,784	0,708	3,248	0,848	332,858
8,0	-64,692	15,295	0,317	1,724	0,257	91,219
9,0	-64,638	15,446	0,211	0,885	0,17	22,09

Lancio n°15 Xp=-122,89 m yp=78,98 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-120,288	72,677	7,547	-4,109	0,868	2464,203
2,0	-109,292	56,277	8,939	-12,185	1,457	7158,04
3,0	-108,449	55,084	12,794	-7,846	0,094	5801,781
4,0	-104,052	51,809	15,157	-2,914	0,344	6400,836
5,0	-66,029	13,632	9,766	1,383	2,509	18308,84
6,0	-65,256	13,711	0,346	5,193	0,079	2279,881
7,0	-64,958	14,547	0,733	3,337	0,861	351,442
8,0	-64,767	15,083	0,323	1,777	0,261	97,416
9,0	-64,71	15,244	0,22	0,911	0,177	23,341

Lancio n°16 Xp=-122,6 m yp=78,45 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-120,073	72,44	7,436	-4,048	0,843	2368,417
2,0	-109,315	56,317	8,873	-12,053	1,447	7016,169
3,0	-108,433	55,07	12,703	-7,777	0,099	5715,38
4,0	-104,06	51,812	15,057	-2,88	0,344	6314,819
5,0	-66,234	13,621	9,696	1,379	2,512	18237,22
6,0	-65,256	13,71	0,36	5,234	0,101	2243,791
7,0	-64,946	14,581	0,731	3,331	0,861	350,338
8,0	-64,756	15,116	0,323	1,773	0,261	96,913
9,0	-64,699	15,276	0,22	0,909	0,177	23,25

Lancio n°17 Xp=-122,31 m yp=77,93 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-119,861	72,206	7,319	-3,987	0,817	2271,741
2,0	-109,366	56,406	8,794	-11,908	1,434	6857,783
3,0	-108,405	55,046	12,622	-7,7	0,109	5637,411
4,0	-104,055	51,81	14,96	-2,85	0,345	6230,619
5,0	-66,427	13,61	9,629	1,375	2,515	18167,37
6,0	-65,258	13,705	0,375	5,277	0,121	2210,83
7,0	-64,935	14,612	0,729	3,325	0,861	349,099
8,0	-64,745	15,145	0,322	1,769	0,261	96,383
9,0	-64,688	15,305	0,218	0,907	0,176	23,157

Lancio n°18 Xp=-122,02 m yp=77,41 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-119,651	71,974	7,196	-3,926	0,79	2174,073
2,0	-109,447	56,547	8,702	-11,749	1,418	6681,809
3,0	-108,367	55,014	12,551	-7,614	0,124	5567,852
4,0	-96,786	43,811	15,9	-5,946	0,923	8807,707
5,0	-65,829	13,644	10,8	1,503	1,947	16817,92
6,0	-65,256	13,71	0,466	5,493	0,053	2796,753
7,0	-64,858	14,827	0,711	3,264	0,853	336,534
8,0	-64,675	15,343	0,319	1,733	0,258	92,169

9,0	-64,62	15,495	0,212	0,89	0,171	22,313

Lancio n°19 Xp=-121,73 m yp=76,88 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-119,444	71,746	7,066	-3,864	0,762	2075,313
2,0	-109,555	56,733	9,946	-10,318	1,399	6490,348
3,0	-107,189	54,0	12,502	-8,18	0,238	5748,736
4,0	-104,435	51,96	14,759	-2,949	0,22	5954,807
5,0	-67,338	13,558	9,482	1,365	2,514	18112,55
6,0	-65,738	13,649	9,276	0,78	0,169	2144,917
7,0	-65,268	13,676	0,307	5,082	0,051	2048,669
8,0	-65,005	14,417	0,74	3,357	0,861	355,377
9,0	-64,812	14,958	0,323	1,79	0,261	99,11
10,0	-64,754	15,121	0,224	0,918	0,18	23,644

Lancio n°20 Xp=-121,44 m yp=76,36 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-119,24	71,522	6,928	-3,803	0,733	1975,331
2,0	-109,663	56,891	9,831	-10,159	1,382	6308,188
3,0	-107,136	53,955	12,445	-8,068	0,257	5685,486
4,0	-104,405	51,949	14,657	-2,938	0,219	5865,188
5,0	-67,549	13,546	9,413	1,361	2,515	18040,87
6,0	-65,961	13,636	9,208	0,776	0,169	2113,609
7,0	-65,483	13,663	9,0	0,753	0,052	2018,428
8,0	-65,267	13,679	0,238	4,885	0,024	1931,755
9,0	-65,063	14,253	0,755	3,397	0,86	363,36
10,0	-64,866	14,804	0,324	1,818	0,26	102,646
11,0	-64,806	14,973	0,23	0,931	0,184	24,299

Lancio n°21 Xp=-121,15 m yp=75,83 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-119,04	71,302	6,78	-3,742	0,703	1873,958
2,0	-109,8	57,09	9,704	-9,988	1,363	6111,72
3,0	-107,082	53,908	12,393	-7,945	0,28	5626,767
4,0	-104,369	51,934	14,554	-2,93	0,219	5775,342
5,0	-67,762	13,534	9,342	1,358	2,515	17968,55
6,0	-66,185	13,624	9,139	0,773	0,169	2082,307
7,0	-65,711	13,65	8,933	0,747	0,052	1988,313
8,0	-65,273	13,675	8,731	0,733	0,049	1899,747

Lancio n°22 Xp=-120,96 m yp=75,65 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-118,843	71,084	6,801	-3,75	0,707	1887,876
2,0	-109,456	56,562	8,486	-11,293	1,38	6222,782
3,0	-108,336	54,987	12,191	-7,379	0,132	5242,974
4,0	-104,094	51,825	14,488	-2,69	0,348	5837,741
5,0	-67,405	13,554	9,299	1,357	2,532	17840,5
6,0	-65,832	13,644	9,096	0,771	0,169	2063,075
7,0	-65,359	13,67	8,891	0,743	0,052	1969,745
8,0	-65,268	13,678	0,208	4,798	0,01	1887,894
9,0	-65,089	14,179	0,762	3,417	0,859	367,488
10,0	-64,891	14,736	0,325	1,832	0,26	104,481
11,0	-64,83	14,907	0,234	0,938	0,187	24,639

Lancio n°23 Xp=-120,56 m yp=75,21 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-118,346	70,323	5,799	-5,75	0,738	1993,199
2,0	-114,237	63,785	7,123	-8,995	0,709	3736,656
3,0	-111,418	59,458	8,181	-10,284	0,396	4556,557
4,0	-108,455	55,089	12,444	-7,09	0,362	5549,16
5,0	-96,346	43,545	15,7	-5,822	0,973	8663,329
6,0	-65,796	13,646	10,682	1,5	1,946	16543,47
7,0	-65,256	13,709	0,446	5,44	0,051	2736,871
8,0	-64,876	14,778	0,714	3,274	0,854	338,423
9,0	-64,691	15,297	0,319	1,738	0,259	92,812
10,0	-64,636	15,45	0,213	0,892	0,172	22,434

Lancio n°24 Xp=-120,16 m yp=74,77 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-117,838	69,515	5,979	-5,863	0,773	2114,163
2,0	-113,389	62,436	7,354	-9,255	0,744	3996,03
3,0	-110,739	58,464	8,146	-10,514	0,36	4629,458
4,0	-108,401	55,043	12,273	-7,083	0,287	5335,67
5,0	-96,603	43,701	15,564	-5,741	0,961	8497,007
6,0	-66,111	13,628	10,574	1,493	1,959	16478,26
7,0	-65,254	13,717	0,46	5,491	0,081	2673,632
8,0	-64,86	14,823	0,714	3,278	0,856	339,369
9,0	-64,675	15,343	0,32	1,74	0,259	92,953
10,0	-64,62	15,497	0,213	0,893	0,171	22,488

Lancio n°25 Xp=-119,75 m yp=74,32 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-117,336	68,716	6,147	-5,971	0,806	2232,03
2,0	-112,577	61,153	8,154	-8,961	0,774	4233,759
3,0	-108,133	54,812	12,277	-6,821	0,545	5577,577
4,0	-96,073	43,38	15,493	-5,702	0,982	8435,888
5,0	-65,881	13,641	10,55	1,495	1,949	16303,95
6,0	-65,255	13,712	0,434	5,415	0,059	2667,146
7,0	-64,884	14,755	0,716	3,283	0,855	340,332
8,0	-64,698	15,277	0,32	1,744	0,259	93,418
9,0	-64,643	15,431	0,214	0,895	0,172	22,564

Lancio n°26 Xp=-119,35 m yp=73,88 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-116,839	67,926	6,303	-6,075	0,837	2347,268
2,0	-111,913	60,181	8,247	-9,126	0,782	4367,885
3,0	-107,939	54,646	12,183	-6,877	0,482	5417,16
4,0	-96,189	43,45	15,421	-5,662	0,964	8324,189
5,0	-66,041	13,632	10,493	1,491	1,955	16266,67
6,0	-65,254	13,716	0,442	5,441	0,075	2634,387
7,0	-64,876	14,778	0,717	3,284	0,856	340,715
8,0	-64,69	15,3	0,32	1,744	0,259	93,457
9,0	-64,635	15,455	0,214	0,895	0,172	22,581

Lancio n°27 Xp=-118,95 m yp=73,43 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-116,346	67,142	6,45	-6,176	0,867	2460,252
2,0	-111,267	59,237	8,331	-9,28	0,787	4493,002
3,0	-107,801	54,527	12,053	-6,935	0,416	5243,4
4,0	-96,398	43,577	15,325	-5,608	0,946	8191,604
5,0	-66,284	13,618	10,416	1,486	1,965	16229,57
6,0	-65,254	13,717	0,456	5,487	0,099	2591,0
7,0	-64,863	14,815	0,716	3,285	0,858	341,016
8,0	-64,677	15,337	0,321	1,744	0,26	93,423
9,0	-64,622	15,492	0,213	0,895	0,172	22,588

Lancio n°28 Xp=-118,54 m yp=72,99 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-115,857	66,364	6,589	-6,274	0,896	2571,255
2,0	-110,639	58,319	8,407	-9,425	0,792	4609,777
3,0	-107,724	54,461	11,882	-6,995	0,347	5054,402
4,0	-96,716	43,769	15,203	-5,535	0,927	8033,352
5,0	-66,626	13,599	10,315	1,479	1,979	16191,92
6,0	-65,257	13,708	0,48	5,562	0,133	2536,945
7,0	-64,844	14,867	0,716	3,285	0,859	341,123
8,0	-64,658	15,39	0,321	1,743	0,26	93,289
9,0	-64,603	15,544	0,213	0,895	0,172	22,581

Lancio n°29 Xp=-118,14 m yp=72,54 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-115,372	65,591	6,72	-6,37	0,923	2680,497
2,0	-110,027	57,424	8,475	-9,561	0,795	4718,756
3,0	-107,721	54,458	11,655	-7,061	0,272	4846,848
4,0	-104,179	51,859	13,805	-2,56	0,304	5240,896
5,0	-69,549	14,57	16,341	-12,204	2,509	17043,44
6,0	-68,177	13,511	14,212	2,107	0,084	10219,35
7,0	-65,247	13,737	1,095	7,005	0,206	4815,939
8,0	-64,369	16,2	0,791	3,415	0,801	362,077
9,0	-63,844	16,306	1,848	0,926	0,664	255,556
10,0	-63,518	16,317	1,794	0,324	0,177	92,875
11,0	-63,42	16,32	1,756	0,139	0,054	77,407

Lancio n°30 Xp=-117,74 m yp=72,1 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-114,889	64,823	6,845	-6,463	0,95	2788,178
2,0	-109,341	56,362	7,191	-10,828	0,811	4883,312
3,0	-108,625	55,235	11,253	-6,446	0,1	4382,729
4,0	-104,057	51,81	13,48	-2,29	0,406	5093,875
5,0	-70,209	15,136	16,092	-11,992	2,511	16592,65
6,0	-68,139	13,513	13,942	2,084	0,129	10093,07
7,0	-65,248	13,734	1,058	6,931	0,207	4634,759
8,0	-64,393	16,133	0,779	3,388	0,807	357,114
9,0	-63,898	16,305	1,836	0,87	0,636	228,822
10,0	-63,595	16,314	1,784	0,307	0,165	90,357
11,0	-63,504	16,317	1,747	0,134	0,051	76,45

Lancio n°31 Xp=-117,25 m yp=71,39 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)

1,0	-114,366	63,992	6,892	-6,498	0,96	2829,825
2,0	-108,673	55,277	11,266	-5,689	0,826	4993,32
3,0	-96,783	43,81	14,512	-5,095	1,055	7537,705
4,0	-67,495	13,549	9,823	1,453	2,018	15622,34
5,0	-65,699	13,651	9,607	0,82	0,183	2302,415
6,0	-65,267	13,678	0,344	5,189	0,045	2198,342
7,0	-64,971	14,51	0,734	3,339	0,861	351,906
8,0	-64,78	15,047	0,323	1,778	0,261	97,569
9,0	-64,723	15,208	0,221	0,912	0,177	23,372

Lancio n°32 Xp=-116,93 m yp=70,88 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-114,047	63,484	6,892	-6,498	0,96	2829,825
2,0	-108,542	55,165	11,175	-5,651	0,799	4861,721
3,0	-96,812	43,827	14,426	-5,044	1,05	7436,96
4,0	-67,625	13,542	9,76	1,45	2,023	15559,3
5,0	-65,841	13,643	9,545	0,816	0,183	2273,153
6,0	-65,305	13,673	9,33	0,777	0,056	2168,989

Lancio n°33 Xp=-116,61 m yp=70,38 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-113,728	62,976	6,892	-6,498	0,96	2829,825
2,0	-108,418	55,057	11,078	-5,616	0,77	4728,345
3,0	-96,856	43,854	14,335	-4,992	1,044	7333,097
4,0	-67,77	13,534	9,694	1,446	2,029	15496,95
5,0	-65,998	13,634	9,48	0,813	0,183	2242,509
6,0	-65,466	13,664	9,267	0,771	0,056	2139,521
7,0	-65,267	13,679	0,272	4,985	0,021	2048,538
8,0	-65,033	14,336	0,748	3,378	0,861	359,721
9,0	-64,838	14,883	0,324	1,805	0,261	100,938
10,0	-64,779	15,049	0,228	0,925	0,183	23,985

Lancio n°34 Xp=-116,29 m yp=69,87 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-113,408	62,468	6,892	-6,498	0,96	2829,829
2,0	-108,3	54,956	10,975	-5,582	0,741	4593,005
3,0	-96,917	43,891	14,241	-4,937	1,037	7225,72
4,0	-67,933	13,525	9,623	1,442	2,035	15435,35
5,0	-66,173	13,624	9,411	0,809	0,183	2210,327
6,0	-65,645	13,654	9,2	0,765	0,056	2108,578
7,0	-65,268	13,677	0,286	5,022	0,041	2015,984
8,0	-65,022	14,367	0,744	3,368	0,86	357,677
9,0	-64,828	14,912	0,323	1,798	0,26	100,111
10,0	-64,77	15,076	0,226	0,922	0,181	23,829

Lancio n°35 Xp=-115,97 m yp=69,36 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-113,089	61,96	6,892	-6,498	0,96	2829,826
2,0	-108,19	54,861	10,865	-5,549	0,711	4455,471
3,0	-96,997	43,939	14,142	-4,879	1,03	7114,358
4,0	-68,114	13,514	9,549	1,438	2,042	15374,6
5,0	-66,368	13,613	9,338	0,805	0,183	2176,419

6,0	-65,844	13,643	9,129	0,758	0,056	2075,981
7,0	-65,396	13,668	8,922	0,75	0,049	1984,014
8,0	-65,267	13,678	0,216	4,822	0,014	1900,27
9,0	-65,082	14,199	0,76	3,411	0,859	366,325
10,0	-64,884	14,755	0,325	1,828	0,26	103,963
11,0	-64,823	14,925	0,233	0,936	0,186	24,543

Lancio n°36 Xp=-115,65 m yp=68,85 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-112,77	61,452	6,892	-6,498	0,96	2829,825
2,0	-108,088	54,774	10,747	-5,519	0,679	4315,485
3,0	-97,098	44,001	14,037	-4,818	1,023	6998,462
4,0	-68,329	13,524	16,315	-12,134	2,049	15307,66

Lancio n°37 Xp=-115,33 m yp=68,34 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-112,46	60,981	7,198	-6,027	0,957	2817,279
2,0	-107,253	54,056	10,765	-5,612	0,723	4354,395
3,0	-96,6	43,699	14,013	-4,821	0,99	6895,756
4,0	-68,051	13,518	9,474	1,437	2,037	15194,36
5,0	-66,313	13,616	9,264	0,801	0,183	2142,676
6,0	-65,792	13,646	9,057	0,752	0,056	2043,403
7,0	-65,352	13,671	8,852	0,744	0,049	1953,024
8,0	-65,268	13,677	0,201	4,779	0,01	1871,582
9,0	-65,095	14,162	0,764	3,421	0,859	368,319
10,0	-64,896	14,72	0,325	1,835	0,26	104,874
11,0	-64,835	14,892	0,234	0,94	0,187	24,712

Lancio n°38 Xp=-115,01 m yp=67,84 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-112,156	60,537	7,174	-6,01	0,952	2796,148
2,0	-107,162	53,977	10,638	-5,575	0,696	4220,039
3,0	-96,711	43,766	13,899	-4,755	0,982	6774,679
4,0	-68,273	13,505	9,388	1,432	2,046	15130,8
5,0	-66,551	13,603	9,18	0,796	0,183	2104,045
6,0	-66,034	13,632	8,975	0,744	0,056	2006,274
7,0	-65,604	13,657	8,771	0,738	0,048	1917,659
8,0	-65,268	13,678	0,224	4,836	0,038	1832,856
9,0	-65,076	14,217	0,757	3,399	0,858	363,676
10,0	-64,879	14,769	0,324	1,821	0,26	103,049
11,0	-64,819	14,938	0,232	0,933	0,186	24,356

Lancio n°39 Xp=-114,69 m yp=67,33 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-111,852	60,092	7,151	-5,993	0,947	2774,965
2,0	-107,078	53,905	10,503	-5,54	0,668	4083,69
3,0	-96,84	43,844	13,781	-4,685	0,975	6649,573
4,0	-68,719	13,858	16,113	-11,96	2,041	14946,0
5,0	-68,251	13,506	14,212	2,136	0,029	9666,633
6,0	-65,246	13,739	1,098	7,014	0,211	4816,408
7,0	-64,366	16,21	0,792	3,419	0,801	362,898
8,0	-63,837	16,307	1,849	0,934	0,668	259,344
9,0	-63,507	16,317	1,795	0,327	0,178	93,216

10,0	-63,409	16,32	1,757	0,14	0,055	77,535

Lancio n°40 Xp=-114,37 m yp=66,82 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-111,548	59,648	7,127	-5,975	0,942	2753,74
2,0	-107,001	53,839	10,358	-5,507	0,638	3945,07
3,0	-96,99	43,936	13,656	-4,612	0,966	6519,904
4,0	-69,236	14,302	16,007	-11,869	2,032	14730,98
5,0	-68,196	13,51	14,055	2,118	0,065	9681,333
6,0	-65,246	13,738	1,074	6,964	0,21	4710,134
7,0	-64,382	16,166	0,784	3,4	0,805	359,298
8,0	-63,872	16,305	1,841	0,898	0,649	241,667
9,0	-63,558	16,316	1,788	0,316	0,171	91,51
10,0	-63,464	16,319	1,75	0,136	0,053	76,837

Lancio n°41 Xp=-114,05 m yp=66,31 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-111,245	59,204	7,103	-5,958	0,936	2732,465
2,0	-106,934	53,781	10,204	-5,477	0,607	3803,832
3,0	-97,165	44,041	13,524	-4,534	0,957	6385,038
4,0	-69,8	14,786	15,895	-11,772	2,023	14503,17
5,0	-68,152	13,512	13,887	2,098	0,104	9702,213
6,0	-65,247	13,736	1,05	6,914	0,209	4598,208
7,0	-64,398	16,12	0,776	3,382	0,808	356,02
8,0	-63,909	16,304	1,834	0,858	0,63	223,674
9,0	-63,61	16,314	1,782	0,303	0,163	89,829
10,0	-63,521	16,317	1,745	0,133	0,05	76,233

Lancio n°42 Xp=-113,73 m yp=65,8 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-110,941	58,76	7,078	-5,941	0,931	2711,131
2,0	-106,877	53,733	10,037	-5,451	0,574	3659,527
3,0	-104,05	51,808	11,69	-2,132	0,282	3699,798
4,0	-77,86	22,412	14,579	-11,338	2,24	13101,05
5,0	-70,3	15,215	15,708	-12,377	0,519	10483,55
6,0	-68,24	13,507	13,569	2,048	0,131	10062,34
7,0	-65,252	13,72	0,995	6,785	0,22	4390,576
8,0	-64,443	15,994	0,758	3,34	0,814	348,158
9,0	-64,01	16,301	1,82	0,727	0,571	175,231
10,0	-63,762	16,309	1,772	0,263	0,136	85,527
11,0	-63,688	16,311	1,736	0,12	0,042	75,111

Lancio n°43 Xp=-113,41 m yp=65,3 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-110,638	58,317	7,053	-5,924	0,926	2689,746
2,0	-106,834	53,695	9,856	-5,429	0,539	3511,574
3,0	-104,136	51,842	11,518	-2,076	0,274	3587,734
4,0	-78,562	23,05	14,432	-11,203	2,22	12799,88
5,0	-70,933	15,758	15,595	-12,259	0,529	10341,01
6,0	-68,254	13,506	13,401	2,028	0,172	10089,73
7,0	-65,254	13,715	0,962	6,709	0,224	4282,679
8,0	-64,468	15,922	0,749	3,318	0,817	344,016
9,0	-64,07	16,299	1,814	0,63	0,532	148,175

10,0	-63,859	16,306	1,769	0,234	0,116	83,134
11,0	-63,795	16,308	1,733	0,111	0,036	74,693

Lancio n°44 Xp=-113,1 m yp=64,79 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-110,335	57,873	7,029	-5,906	0,92	2668,314
2,0	-106,805	53,671	9,658	-5,411	0,502	3359,174
3,0	-104,231	51,879	11,338	-2,008	0,267	3474,165
4,0	-79,274	23,697	14,278	-11,062	2,201	12493,1
5,0	-71,583	16,315	15,475	-12,136	0,539	10191,25
6,0	-68,284	13,505	13,228	2,008	0,213	10116,02
7,0	-65,257	13,707	0,928	6,626	0,229	4173,277
8,0	-64,497	15,843	0,739	3,296	0,82	339,968
9,0	-64,143	16,297	1,812	0,489	0,479	118,793
10,0	-63,984	16,302	1,77	0,19	0,088	80,688

Lancio n°45 Xp=-112,78 m yp=64,28 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-110,031	57,429	7,003	-5,889	0,915	2646,826
2,0	-106,796	53,663	9,437	-5,399	0,462	3201,2
3,0	-104,335	51,921	11,15	-1,925	0,261	3358,754
4,0	-80,0	24,356	14,116	-10,914	2,182	12179,17
5,0	-72,253	16,89	15,347	-12,007	0,549	10033,12
6,0	-68,63	13,782	15,425	-12,877	0,236	10047,95
7,0	-68,299	13,504	13,538	2,069	0,021	9681,291
8,0	-65,252	13,721	0,987	6,765	0,225	4370,795
9,0	-64,449	15,977	0,755	3,334	0,814	346,915
10,0	-64,024	16,3	1,818	0,706	0,563	168,832
11,0	-63,784	16,308	1,77	0,257	0,132	84,909
12,0	-63,712	16,311	1,734	0,118	0,041	74,944

Lancio n°46 Xp=-112,46 m yp=63,77 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-109,728	56,986	6,978	-5,871	0,91	2625,291
2,0	-106,813	53,677	9,188	-5,395	0,418	3035,953
3,0	-104,453	51,967	10,951	-1,824	0,257	3240,94
4,0	-80,746	25,034	13,945	-10,758	2,165	11854,89
5,0	-72,952	17,489	15,211	-11,871	0,559	9864,597
6,0	-69,3	14,357	15,297	-12,761	0,24	9879,289
7,0	-68,302	13,504	13,35	2,047	0,065	9708,21
8,0	-65,254	13,715	0,952	6,683	0,228	4250,638
9,0	-64,476	15,9	0,746	3,311	0,818	342,659
10,0	-64,09	16,298	1,813	0,595	0,518	139,891
11,0	-63,891	16,305	1,768	0,223	0,109	82,381
12,0	-63,831	16,307	1,733	0,107	0,034	74,576

Lancio n°47 Xp=-112,14 m yp=63,26 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-109,41	56,484	6,258	-6,775	0,909	2623,526
2,0	-107,983	54,684	8,613	-5,078	0,228	2590,831
3,0	-104,748	52,085	10,74	-1,367	0,376	3218,141
4,0	-81,151	25,403	13,772	-10,601	2,197	11615,98
5,0	-73,373	17,851	15,06	-11,732	0,565	9673,937

6,0	-69,726	14,722	15,152	-12,634	0,242	9691,768
7,0	-68,599	13,755	15,01	-12,763	0,074	9564,973
8,0	-68,305	13,503	13,238	2,057	0,02	9303,472
9,0	-65,254	13,717	0,933	6,642	0,23	4180,105
10,0	-64,488	15,866	0,741	3,301	0,82	340,917
11,0	-64,121	16,297	1,811	0,535	0,495	127,075
12,0	-63,945	16,303	1,768	0,204	0,097	81,285
13,0	-63,892	16,305	1,733	0,102	0,03	74,501

Lancio n°48 Xp=-111,82 m yp=62,76 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-109,069	55,889	6,293	-6,802	0,916	2652,265
2,0	-108,233	54,898	8,086	-5,158	0,133	2340,166
3,0	-105,272	52,352	8,775	-6,316	0,366	3019,605
4,0	-105,093	52,221	10,276	-2,131	0,02	2813,769
5,0	-84,66	28,59	13,301	-10,169	1,988	10459,37
6,0	-79,47	23,875	13,603	-11,778	0,39	8213,713
7,0	-77,863	22,415	13,558	-12,137	0,118	8174,27
8,0	-77,368	21,965	13,382	-12,101	0,037	8013,932
9,0	-77,216	21,828	13,166	-11,943	0,011	7776,972

Lancio n°49 Xp=-111,5 m yp=62,25 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-108,738	55,333	7,943	-2,734	0,92	2668,408
2,0	-99,751	45,961	9,545	-8,197	1,131	4729,792
3,0	-98,953	45,241	11,465	0,907	0,084	3974,626
4,0	-68,976	14,079	14,5	-10,614	2,615	13448,5
5,0	-68,215	13,508	13,059	2,11	0,052	7845,944
6,0	-65,247	13,735	0,916	6,612	0,227	4068,103
7,0	-64,493	15,853	0,738	3,298	0,824	340,647
8,0	-64,134	16,297	1,811	0,511	0,486	122,43
9,0	-63,967	16,302	1,768	0,197	0,092	80,863
10,0	-63,917	16,304	1,733	0,099	0,028	74,457

Lancio n°50 Xp=-111,2 m yp=61,8 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-108,501	55,129	7,867	-2,691	0,9	2585,66
2,0	-99,566	45,745	9,532	-8,137	1,136	4700,481
3,0	-99,007	45,251	11,4	0,882	0,059	3870,038
4,0	-69,387	14,431	14,442	-10,562	2,598	13300,24
5,0	-68,176	13,511	12,949	2,096	0,084	7896,503
6,0	-65,248	13,734	0,899	6,573	0,226	4000,059
7,0	-64,506	15,817	0,734	3,29	0,826	339,31
8,0	-64,17	16,296	1,811	0,431	0,458	109,503
9,0	-64,032	16,3	1,771	0,172	0,076	79,922

Lancio n°51 Xp=-110,86 m yp=61,3 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-108,23	54,896	7,784	-2,646	0,877	2498,542
2,0	-99,349	45,493	9,521	-8,074	1,141	4671,065
3,0	-99,087	45,267	11,325	0,842	0,028	3750,698
4,0	-69,91	14,88	14,372	-10,499	2,576	13116,05
5,0	-68,14	13,513	12,814	2,078	0,123	7966,058

6,0	-65,248	13,732	0,876	6,521	0,226	3917,2
7,0	-64,523	15,769	0,73	3,281	0,828	337,66
8,0	-64,34	16,283	0,313	1,759	0,251	95,893
9,0	-64,229	16,294	0,927	0,542	0,353	71,794
10,0	-64,132	16,297	0,898	0,187	0,104	24,561

Lancio n°52 Xp=-110,52 m yp=60,81 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-107,96	54,663	7,698	-2,602	0,854	2410,948
2,0	-99,161	45,281	9,361	1,306	1,143	4627,965
3,0	-77,531	22,114	12,639	-9,57	2,311	9768,656
4,0	-70,855	15,691	13,832	-10,769	0,528	8093,728
5,0	-68,269	13,505	12,207	2,014	0,187	8021,152
6,0	-65,258	13,704	0,751	6,211	0,247	3557,734
7,0	-64,63	15,468	0,71	3,237	0,837	329,841
8,0	-64,45	15,973	0,314	1,724	0,254	91,405
9,0	-64,396	16,124	0,213	0,885	0,172	21,991

Lancio n°53 Xp=-110,18 m yp=60,31 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-107,692	54,433	7,608	-2,558	0,831	2322,836
2,0	-99,088	45,267	9,265	1,335	1,131	4518,837
3,0	-77,742	22,306	12,564	-9,501	2,304	9658,791
4,0	-71,065	15,871	13,769	-10,709	0,531	8021,396
5,0	-68,281	13,505	12,132	2,007	0,202	8009,116
6,0	-65,26	13,7	0,736	6,174	0,249	3514,379
7,0	-64,643	15,43	0,708	3,234	0,838	329,378
8,0	-64,464	15,935	0,314	1,721	0,254	91,075
9,0	-64,41	16,086	0,212	0,883	0,171	21,944

Lancio n°54 Xp=-109,85 m yp=59,82 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-107,426	54,204	7,513	-2,514	0,807	2234,167
2,0	-99,021	45,254	9,164	1,364	1,119	4409,001
3,0	-77,975	22,517	12,485	-9,429	2,297	9541,714
4,0	-71,296	16,069	13,703	-10,645	0,535	7946,179
5,0	-68,297	13,504	12,051	1,999	0,219	7999,862
6,0	-65,261	13,696	0,719	6,132	0,252	3468,618
7,0	-64,658	15,389	0,707	3,231	0,839	328,945
8,0	-64,479	15,894	0,314	1,719	0,254	90,762
9,0	-64,425	16,044	0,212	0,882	0,17	21,901

Lancio n°55 Xp=-109,51 m yp=59,32 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-107,162	53,977	7,414	-2,472	0,782	2144,892
2,0	-98,961	45,242	9,06	1,394	1,106	4298,392
3,0	-78,23	22,749	12,401	-9,353	2,288	9416,834
4,0	-71,549	16,286	13,633	-10,578	0,539	7867,778
5,0	-68,444	13,623	13,74	-11,444	0,228	7953,72
6,0	-68,302	13,504	12,437	2,063	0,01	7633,424
7,0	-65,254	13,715	0,794	6,316	0,245	3691,816
8,0	-64,593	15,573	0,715	3,247	0,833	331,43
9,0	-64,412	16,08	0,314	1,732	0,253	92,517

10,0	-64,358	16,233	0,216	0,889	0,174	22,159

Lancio n°56 Xp=-109,17 m yp=58,82 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-106,9	53,752	7,309	-2,43	0,756	2054,951
2,0	-98,908	45,232	8,95	1,425	1,093	4186,933
3,0	-78,511	23,004	12,312	-9,272	2,279	9283,438
4,0	-71,826	16,523	13,56	-10,508	0,543	7785,816
5,0	-68,716	13,856	13,671	-11,382	0,229	7872,761
6,0	-68,299	13,504	12,345	2,054	0,031	7632,368
7,0	-65,255	13,712	0,777	6,276	0,247	3638,119
8,0	-64,607	15,533	0,713	3,242	0,835	330,74
9,0	-64,427	16,039	0,314	1,729	0,253	92,044
10,0	-64,372	16,192	0,215	0,887	0,173	22,086

Lancio n°57 Xp=-108,83 m yp=58,33 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-106,641	53,529	7,199	-2,389	0,73	1964,284
2,0	-98,863	45,223	8,836	1,456	1,08	4074,539
3,0	-78,819	23,284	12,218	-9,187	2,269	9140,733
4,0	-72,13	16,784	13,483	-10,433	0,547	7699,87
5,0	-69,014	14,111	13,598	-11,317	0,231	7787,755
6,0	-68,3	13,504	12,247	2,044	0,052	7634,986
7,0	-65,257	13,709	0,758	6,23	0,249	3581,185
8,0	-64,623	15,489	0,711	3,238	0,836	330,071
9,0	-64,443	15,995	0,314	1,725	0,253	91,579
10,0	-64,389	16,146	0,214	0,885	0,172	22,019

Lancio n°58 Xp=-108,49 m yp=57,83 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-106,384	53,308	7,082	-2,349	0,702	1872,805
2,0	-98,827	45,216	8,716	1,488	1,067	3961,115
3,0	-79,158	23,591	12,118	-9,096	2,257	8987,768
4,0	-72,464	17,071	13,402	-10,353	0,552	7609,433
5,0	-69,341	14,392	13,521	-11,247	0,233	7698,18
6,0	-68,373	13,562	13,403	-11,389	0,072	7622,275
7,0	-68,305	13,503	12,185	2,053	0,005	7366,817
8,0	-65,256	13,71	0,748	6,206	0,25	3545,313
9,0	-64,63	15,468	0,71	3,237	0,837	329,894
10,0	-64,45	15,974	0,314	1,724	0,254	91,381
11,0	-64,396	16,125	0,213	0,884	0,171	21,995

Lancio n°59 Xp=-108,11 m yp=57,23 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-106,118	53,079	6,91	-2,298	0,663	1747,064
2,0	-98,84	45,219	8,545	1,53	1,053	3824,183
3,0	-79,73	24,112	11,969	-8,96	2,236	8748,301
4,0	-73,023	17,551	13,282	-10,236	0,56	7479,327
5,0	-69,886	14,859	13,408	-11,146	0,236	7568,792
6,0	-68,913	14,025	13,294	-11,294	0,073	7497,83
7,0	-68,615	13,769	13,099	-11,203	0,022	7312,578
8,0	-68,523	13,69	12,88	-11,038	0,007	7081,961

Lancio n°60 Xp=-107,81 m yp=56,71 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-105,937	52,924	6,732	-2,252	0,624	1625,684
2,0	-98,912	45,233	8,374	1,569	1,044	3707,946
3,0	-80,391	24,712	11,811	-8,816	2,212	8486,98
4,0	-74,102	18,627	11,209	-12,379	0,532	7171,042
5,0	-73,572	18,03	11,093	-12,408	0,047	6821,811

Lancio n°61 Xp=-107,51 m yp=56,19 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-105,763	52,774	6,536	-2,21	0,583	1502,202
2,0	-99,008	45,252	8,188	1,61	1,033	3588,998
3,0	-81,129	25,382	11,636	-8,657	2,183	8200,003
4,0	-76,588	21,257	11,993	-10,316	0,39	6355,348
5,0	-72,261	16,897	13,349	-10,435	0,361	7393,663
6,0	-69,495	14,524	13,436	-11,213	0,207	7604,68
7,0	-68,638	13,788	13,307	-11,319	0,064	7517,877
8,0	-68,375	13,563	13,107	-11,214	0,02	7323,536
9,0	-68,305	13,503	11,967	2,047	0,005	7086,39
10,0	-65,257	13,706	0,708	6,109	0,255	3420,27
11,0	-64,662	15,377	0,706	3,232	0,84	329,274
12,0	-64,483	15,882	0,315	1,719	0,255	90,724
13,0	-64,429	16,033	0,211	0,882	0,17	21,908

Lancio n°62 Xp=-107,4 m yp=56,16 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-105,624	52,654	6,589	-2,22	0,594	1534,806
2,0	-98,869	45,224	8,229	1,606	1,025	3575,0
3,0	-80,788	25,072	11,69	-8,705	2,197	8309,575
4,0	-76,226	20,929	12,044	-10,362	0,39	6410,883
5,0	-71,946	16,627	13,381	-10,474	0,355	7426,349
6,0	-69,206	14,276	13,463	-11,24	0,205	7636,438
7,0	-68,358	13,548	13,333	-11,342	0,063	7547,407
8,0	-68,305	13,503	12,137	2,052	0,004	7292,001
9,0	-65,256	13,709	0,739	6,184	0,251	3517,244
10,0	-64,637	15,448	0,709	3,236	0,838	329,702
11,0	-64,457	15,954	0,314	1,722	0,254	91,207
12,0	-64,403	16,105	0,213	0,884	0,171	21,969

Lancio n°63 Xp=-106,95 m yp=55,77 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-105,169	52,263	6,589	-2,22	0,594	1534,806
2,0	-104,488	51,982	6,548	-2,162	0,103	1195,678
3,0	-97,943	44,92	7,639	-7,871	1,0	3478,483
4,0	-97,119	44,013	10,369	-3,693	0,108	3147,104
5,0	-79,812	24,186	13,087	-9,996	1,669	9443,467
6,0	-72,599	17,187	14,357	-11,16	0,551	8757,163
7,0	-69,217	14,286	14,457	-12,047	0,236	8813,755
8,0	-68,302	13,504	12,808	2,045	0,063	8670,317
9,0	-65,255	13,712	0,857	6,464	0,238	3914,264
10,0	-64,546	15,704	0,725	3,265	0,827	334,571
11,0	-64,364	16,214	0,313	1,749	0,251	94,669
12,0	-64,269	16,293	0,93	0,409	0,304	48,323

13,0	-64,198	16,295	0,905	0,146	0,077	22,76

Lancio n°64 Xp=-106,49 m yp=55,38 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-104,793	52,102	5,777	1,014	0,567	1458,067
2,0	-96,614	43,708	9,477	-2,034	1,416	3547,265
3,0	-79,387	23,8	12,412	-9,369	1,818	8789,383
4,0	-72,533	17,13	13,692	-10,598	0,552	7949,911
5,0	-69,33	14,382	13,805	-11,49	0,234	8029,547
6,0	-68,338	13,531	13,683	-11,629	0,072	7945,212

Lancio n°65 Xp=-106,04 m yp=54,99 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-104,426	51,957	5,698	1,007	0,538	1376,315
2,0	-96,361	43,554	9,428	-2,002	1,416	3529,44
3,0	-79,176	23,608	12,385	-9,345	1,823	8776,834
4,0	-72,365	16,986	13,658	-10,574	0,55	7907,634
5,0	-69,185	14,258	13,771	-11,463	0,233	7989,256
6,0	-68,303	13,504	12,342	2,04	0,064	7875,239
7,0	-65,257	13,708	0,775	6,269	0,247	3636,58
8,0	-64,61	15,524	0,712	3,241	0,834	330,479
9,0	-64,43	16,03	0,314	1,728	0,253	91,938
10,0	-64,376	16,182	0,214	0,886	0,172	22,072

Lancio n°66 Xp=-105,59 m yp=54,6 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-104,062	51,813	5,612	0,994	0,508	1294,078
2,0	-96,127	43,412	9,373	-1,967	1,414	3506,802
3,0	-79,005	23,452	12,353	-9,314	1,827	8753,646
4,0	-72,234	16,874	13,62	-10,546	0,548	7860,937
5,0	-69,075	14,163	13,733	-11,431	0,232	7944,459
6,0	-68,301	13,504	12,333	2,043	0,056	7801,543
7,0	-65,256	13,709	0,773	6,266	0,247	3630,817
8,0	-64,611	15,522	0,712	3,241	0,835	330,491
9,0	-64,431	16,028	0,314	1,728	0,253	91,924
10,0	-64,377	16,18	0,214	0,886	0,172	22,072

Lancio n°67 Xp=-105,13 m yp=54,21 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-103,088	49,893	4,454	-6,477	0,681	1802,667
2,0	-102,931	49,659	5,639	-5,424	0,035	1537,578
3,0	-101,627	48,142	6,094	-6,299	0,231	1955,147
4,0	-100,647	47,002	6,359	-6,846	0,161	2201,964
5,0	-99,933	46,172	6,494	-7,168	0,112	2348,842
6,0	-99,424	45,58	6,537	-7,334	0,078	2418,458
7,0	-99,165	45,282	8,574	1,374	0,04	2391,512
8,0	-80,349	24,674	11,937	-8,93	2,195	8589,271
9,0	-73,665	18,135	11,428	-12,551	0,56	7440,761
10,0	-73,526	17,982	13,0	-10,311	0,012	6893,315
11,0	-71,297	16,07	13,044	-10,931	0,171	7172,536
12,0	-70,607	15,478	12,905	-10,99	0,053	7075,557
13,0	-70,396	15,297	12,706	-10,875	0,016	6884,181
14,0	-70,332	15,242	12,49	-10,707	0,005	6661,248

Lancio n°68 Xp=-104,68 m yp=53,82 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-102,543	49,208	6,701	-4,055	0,711	1900,584
2,0	-98,638	45,179	8,341	1,614	0,583	2757,76
3,0	-80,042	24,395	11,818	-8,823	2,23	8563,278
4,0	-73,363	17,842	13,151	-10,115	0,565	7333,686
5,0	-70,235	15,158	13,282	-11,036	0,238	7425,388
6,0	-69,264	14,326	13,172	-11,188	0,073	7359,013
7,0	-68,966	14,07	12,979	-11,099	0,023	7178,461
8,0	-68,875	13,992	12,762	-10,937	0,007	6952,425

Lancio n°69 Xp=-104,22 m yp=53,43 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-102,026	48,606	6,805	-4,101	0,732	1970,783
2,0	-98,489	45,15	8,369	1,577	0,52	2607,582
3,0	-79,777	24,154	11,856	-8,857	2,236	8643,272
4,0	-73,118	17,632	13,176	-10,143	0,562	7358,943
5,0	-70,002	14,959	13,305	-11,057	0,237	7451,274
6,0	-69,036	14,13	13,193	-11,207	0,073	7383,553
7,0	-68,739	13,875	13,0	-11,117	0,022	7201,839
8,0	-68,648	13,798	12,782	-10,955	0,007	6974,875

Lancio n°70 Xp=-104,1 m yp=53,44 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-101,838	48,387	6,916	-4,152	0,754	2048,73
2,0	-98,419	45,136	8,448	1,546	0,494	2583,816
3,0	-79,438	23,846	11,931	-8,926	2,247	8771,235
4,0	-72,793	17,353	13,234	-10,202	0,557	7420,458
5,0	-69,687	14,689	13,359	-11,106	0,235	7512,803
6,0	-68,724	13,863	13,245	-11,253	0,072	7442,583
7,0	-68,428	13,609	13,05	-11,161	0,022	7258,556
8,0	-68,338	13,532	12,832	-10,998	0,007	7029,498

Lancio n°71 Xp=-103,54 m yp=53,22 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-101,102	47,531	7,198	-4,291	0,814	2260,049
2,0	-98,295	45,112	8,595	1,411	0,39	2424,94
3,0	-78,926	23,381	12,059	-9,043	2,254	8972,12
4,0	-72,297	16,927	13,336	-10,303	0,55	7530,764
5,0	-69,205	14,275	13,455	-11,193	0,232	7622,537
6,0	-68,304	13,503	12,117	2,036	0,067	7531,328
7,0	-65,258	13,705	0,734	6,171	0,251	3505,765
8,0	-64,643	15,432	0,708	3,234	0,838	329,457
9,0	-64,463	15,937	0,314	1,721	0,254	91,076
10,0	-64,409	16,088	0,212	0,883	0,171	21,949

Lancio n°72 Xp=-102,46 m yp=51,99 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-100,001	46,251	7,218	-4,302	0,818	2276,415
2,0	-98,511	45,154	8,33	1,062	0,206	1993,719

3,0	-80,696	24,989	11,754	-8,764	2,139	8339,185
4,0	-76,11	20,823	12,107	-10,419	0,39	6478,489
5,0	-71,832	16,529	13,435	-10,525	0,353	7487,298
6,0	-69,092	14,178	13,515	-11,286	0,204	7696,623
7,0	-68,304	13,503	12,173	2,039	0,058	7587,709
8,0	-65,257	13,706	0,744	6,196	0,25	3538,1
9,0	-64,634	15,456	0,709	3,236	0,837	329,67
10,0	-64,454	15,961	0,314	1,723	0,254	91,27
11,0	-64,401	16,112	0,213	0,884	0,171	21,973

Lancio n°73 Xp=-102,19 m yp=51,45 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-99,825	46,047	7,075	-4,229	0,788	2165,503
2,0	-98,607	45,173	8,12	0,978	0,172	1858,311
3,0	-81,669	25,873	11,542	-8,572	2,086	7969,78
4,0	-77,166	21,782	11,902	-10,233	0,39	6257,184
5,0	-72,77	17,333	13,29	-10,365	0,369	7330,917
6,0	-69,964	14,927	13,382	-11,161	0,211	7543,145
7,0	-69,095	14,181	13,257	-11,274	0,065	7460,079
8,0	-68,828	13,952	13,058	-11,171	0,02	7268,654
9,0	-68,747	13,882	12,839	-11,004	0,006	7036,956

Lancio n°74 Xp=-101,92 m yp=50,91 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-99,654	45,848	6,922	-4,155	0,756	2053,045
2,0	-98,716	45,194	7,894	0,873	0,136	1721,681
3,0	-82,723	26,83	11,309	-8,361	2,026	7572,548
4,0	-78,314	22,825	11,676	-10,028	0,39	6017,482
5,0	-76,936	21,573	11,668	-10,42	0,118	6041,892
6,0	-76,51	21,186	11,525	-10,415	0,037	5940,785
7,0	-76,379	21,068	11,342	-10,286	0,011	5770,495

Lancio n°75 Xp=-101,85 m yp=50,7 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-99,635	45,826	6,829	-4,112	0,737	1987,663
2,0	-98,734	45,198	7,793	0,869	0,132	1676,019
3,0	-83,084	27,158	11,213	-8,275	2,008	7427,295
4,0	-78,713	23,188	11,584	-9,944	0,39	5920,543
5,0	-77,347	21,946	11,577	-10,338	0,118	5947,482
6,0	-76,924	21,562	11,436	-10,334	0,036	5848,889
7,0	-76,795	21,445	11,254	-10,207	0,011	5681,61

Lancio n°76 Xp=-101,45 m yp=50,24 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-99,244	45,371	6,829	-4,112	0,737	1987,664
2,0	-99,072	45,264	7,573	0,434	0,025	1502,63
3,0	-84,867	28,82	10,368	-9,987	1,876	6815,857
4,0	-84,336	28,295	10,784	-9,467	0,051	5084,993
5,0	-83,612	27,638	10,709	-9,627	0,067	5109,118
6,0	-83,389	27,436	10,557	-9,559	0,021	4992,402
7,0	-83,321	27,374	10,382	-9,422	0,006	4837,825

Lancio n°77 Xp=-101,06 m yp=49,79 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-98,95	45,24	4,737	2,333	0,704	1879,794
2,0	-91,321	36,276	7,685	-7,011	1,611	3576,556
3,0	-88,396	32,897	8,143	-8,838	0,381	3684,761
4,0	-87,453	31,807	8,196	-9,292	0,116	3791,912
5,0	-87,159	31,467	8,114	-9,318	0,036	3758,657
6,0	-87,068	31,363	7,99	-9,213	0,011	3660,512

Lancio n°78 Xp=-100,67 m yp=49,33 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-98,683	45,188	4,685	2,34	0,663	1745,721
2,0	-91,038	35,949	7,738	-7,043	1,632	3657,233
3,0	-88,047	32,493	8,202	-8,898	0,387	3740,211
4,0	-87,082	31,379	8,257	-9,359	0,118	3848,477
5,0	-86,781	31,031	8,175	-9,388	0,036	3815,222
6,0	-86,689	30,925	8,05	-9,282	0,011	3715,771

Lancio n°79 Xp=-100,28 m yp=48,88 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-98,422	45,137	4,63	2,34	0,619	1611,257
2,0	-90,788	35,66	7,778	-7,064	1,649	3724,585
3,0	-87,742	32,141	8,248	-8,943	0,392	3782,906
4,0	-86,759	31,005	8,304	-9,411	0,119	3892,139
5,0	-86,452	30,651	8,222	-9,441	0,037	3858,992
6,0	-86,358	30,543	8,097	-9,336	0,011	3758,616

Lancio n°80 Xp=-99,89 m yp=48,42 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-98,168	45,087	4,569	2,331	0,574	1476,346
2,0	-90,575	35,414	7,804	-7,073	1,662	3776,748
3,0	-87,484	31,844	8,279	-8,973	0,396	3811,97
4,0	-86,487	30,692	8,336	-9,447	0,12	3922,099
5,0	-86,177	30,333	8,254	-9,478	0,037	3889,181
6,0	-86,081	30,223	8,129	-9,372	0,012	3788,297

Lancio n°81 Xp=-99,5 m yp=47,97 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-97,822	44,76	5,517	-4,381	0,559	1433,852
2,0	-96,88	43,868	7,083	-2,507	0,171	1454,692
3,0	-87,42	31,769	9,442	-9,112	1,336	5352,08
4,0	-84,402	28,356	11,017	-8,963	0,32	5216,206
5,0	-82,054	26,223	11,164	-9,82	0,213	5496,532
6,0	-81,322	25,558	11,08	-9,966	0,066	5471,403
7,0	-81,097	25,353	10,92	-9,89	0,02	5342,723
8,0	-81,028	25,29	10,739	-9,746	0,006	5176,1

Lancio n°82 Xp=-99,11 m yp=47,51 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-97,391	44,19	5,593	-4,412	0,572	1472,099

2,0	-97,328	44,14	6,232	-2,992	0,011	1200,031
3,0	-96,332	43,536	6,456	-3,367	0,16	1332,781
4,0	-95,613	43,101	6,56	-3,594	0,111	1402,524
5,0	-95,104	42,792	6,581	-3,722	0,078	1430,918
6,0	-87,428	31,778	9,185	-8,797	1,166	5023,206
7,0	-84,422	28,374	10,751	-8,722	0,327	4965,183
8,0	-82,134	26,295	10,903	-9,584	0,213	5239,717
9,0	-81,419	25,646	10,824	-9,733	0,066	5220,379
10,0	-81,2	25,446	10,669	-9,661	0,02	5099,053
11,0	-81,132	25,385	10,492	-9,522	0,006	4940,482

Lancio n°83 Xp=-98,72 m yp=47,06 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-97,092	43,997	6,304	-0,501	0,541	1384,852
2,0	-87,488	31,847	8,973	-8,479	1,524	4939,163
3,0	-84,412	28,365	10,532	-8,518	0,343	4768,407
4,0	-82,157	26,316	10,692	-9,39	0,214	5035,676
5,0	-81,452	25,676	10,617	-9,545	0,066	5021,631
6,0	-81,236	25,479	10,466	-9,476	0,02	4906,446
7,0	-81,17	25,419	10,292	-9,34	0,006	4754,205

Lancio n°84 Xp=-98,32 m yp=46,6 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-96,805	43,823	6,165	-0,502	0,507	1291,465
2,0	-87,475	31,833	8,886	-8,372	1,513	4847,639
3,0	-84,414	28,366	10,439	-8,436	0,345	4683,479
4,0	-82,184	26,34	10,6	-9,307	0,214	4948,581
5,0	-81,487	25,707	10,527	-9,463	0,066	4936,232
6,0	-81,272	25,513	10,377	-9,396	0,02	4823,449
7,0	-81,207	25,453	10,205	-9,261	0,006	4673,923

Lancio n°85 Xp=-98,73 m yp=46,73 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)

Lancio n°86 Xp=-98,14 m yp=46,61 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-96,568	43,68	6,242	-0,5	0,526	1342,168
2,0	-86,923	31,195	9,023	-8,506	1,545	5033,138
3,0	-84,175	28,149	10,419	-8,511	0,305	4655,068
4,0	-82,148	26,308	10,552	-9,292	0,195	4908,084
5,0	-81,515	25,733	10,47	-9,42	0,06	4886,259
6,0	-81,321	25,556	10,318	-9,345	0,019	4770,043
7,0	-81,261	25,502	10,146	-9,209	0,006	4620,732

Lancio n°87 Xp=-96,73 m yp=45,8 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-95,129	42,808	6,272	-0,501	0,533	1362,549
2,0	-84,843	28,792	9,346	-8,795	1,64	5551,179
3,0	-84,281	28,246	9,654	-8,494	0,06	4081,918
4,0	-83,739	27,753	9,581	-8,619	0,056	4090,768
5,0	-83,572	27,602	9,443	-8,552	0,017	3994,97

6,0	-83,521	27,555	9,286	-8,428	0,005	3870,25

Lancio n°88 Xp=-96,37 m yp=45,32 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-94,887	42,652	5,021	-4,385	0,493	1255,189

Lancio n°89 Xp=-96,35 m yp=45,3 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-94,87	42,628	5,023	-4,386	0,493	1256,191
2,0	-90,665	35,518	7,728	-7,224	0,837	3408,313
3,0	-87,981	32,417	8,138	-8,88	0,347	3681,664
4,0	-87,117	31,42	8,175	-9,282	0,106	3777,064
5,0	-86,849	31,109	8,088	-9,293	0,033	3736,746
6,0	-86,766	31,014	7,963	-9,184	0,01	3636,537

Lancio n°90 Xp=-95,84 m yp=44,99 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-93,792	40,668	3,848	-6,869	0,681	1805,06
2,0	-92,859	38,713	4,664	-7,796	0,243	2118,99
3,0	-91,944	36,996	7,0	-6,861	0,196	2529,688
4,0	-90,196	34,976	7,289	-8,043	0,25	2949,769
5,0	-89,636	34,329	7,293	-8,308	0,077	3012,978
6,0	-89,462	34,128	7,206	-8,288	0,024	2969,334
7,0	-89,409	34,067	7,092	-8,181	0,007	2885,368

Lancio n°91 Xp=-95,32 m yp=44,68 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-92,753	38,508	5,506	-7,044	0,857	2420,426
2,0	-91,208	36,145	7,113	-7,212	0,281	2666,301
3,0	-89,751	34,462	7,329	-8,156	0,205	2994,15
4,0	-89,288	33,927	7,309	-8,348	0,063	3033,437
5,0	-89,145	33,762	7,215	-8,305	0,02	2978,926

Lancio n°92 Xp=-94,81 m yp=44,37 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-91,934	36,984	6,707	-5,783	0,959	2824,228
2,0	-89,246	33,879	7,232	-7,757	0,401	2885,009
3,0	-88,365	32,861	7,313	-8,263	0,122	3009,027
4,0	-88,09	32,543	7,25	-8,317	0,038	2997,351
5,0	-88,005	32,445	7,142	-8,233	0,012	2923,846

Lancio n°93 Xp=-94,3 m yp=44,06 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-91,328	36,284	6,815	-5,88	0,99	2953,78
2,0	-88,56	33,086	7,343	-7,878	0,406	2977,142
3,0	-87,654	32,039	7,424	-8,389	0,123	3101,985
4,0	-87,37	31,712	7,36	-8,444	0,038	3089,417
5,0	-87,283	31,611	7,251	-8,358	0,012	3013,546

Lancio n°94 Xp=-93,46 m yp=43,24 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-90,438	35,256	6,87	-5,931	1,006	3022,4
2,0	-87,629	32,011	7,4	-7,939	0,409	3024,807
3,0	-86,71	30,95	7,481	-8,454	0,124	3149,972
4,0	-86,423	30,618	7,416	-8,509	0,038	3136,922
5,0	-86,335	30,515	7,307	-8,422	0,012	3059,835

Lancio n°95 Xp=-92,94 m yp=42,46 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-89,979	34,726	6,806	-5,871	0,987	2942,233
2,0	-87,218	31,536	7,334	-7,867	0,406	2969,047
3,0	-86,314	30,491	7,414	-8,378	0,123	3093,82
4,0	-86,031	30,164	7,35	-8,433	0,038	3081,343
5,0	-85,944	30,064	7,242	-8,347	0,012	3005,698

Lancio n°96 Xp=-92,7 m yp=41,91 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-89,829	34,552	6,701	-5,777	0,957	2816,902
2,0	-87,146	31,452	7,226	-7,75	0,4	2879,718
3,0	-86,266	30,436	7,306	-8,255	0,122	3003,683
4,0	-85,991	30,118	7,243	-8,31	0,038	2992,051
5,0	-85,906	30,021	7,136	-8,226	0,012	2918,691

Lancio n°97 Xp=-92,46 m yp=41,36 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-89,682	34,382	6,591	-5,68	0,926	2690,379
2,0	-87,082	31,379	7,111	-7,627	0,394	2786,764
3,0	-86,229	30,394	7,191	-8,125	0,12	2909,612
4,0	-85,962	30,085	7,129	-8,179	0,037	2898,763
5,0	-85,88	29,991	7,024	-8,096	0,011	2827,681

Lancio n°98 Xp=-92,22 m yp=40,81 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-89,539	34,217	6,476	-5,579	0,894	2562,549
2,0	-87,028	31,317	6,99	-7,496	0,388	2689,838
3,0	-86,204	30,364	7,069	-7,987	0,118	2811,239
4,0	-85,946	30,066	7,008	-8,04	0,037	2801,114
5,0	-85,866	29,974	6,905	-7,959	0,011	2732,508

Lancio n°99 Xp=-92,02 m yp=40,35 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-89,42	34,08	6,374	-5,492	0,866	2454,707
2,0	-86,99	31,272	6,883	-7,381	0,381	2605,597
3,0	-86,19	30,349	6,961	-7,865	0,116	2725,487
4,0	-85,94	30,06	6,901	-7,917	0,036	2715,916
5,0	-85,863	29,971	6,799	-7,837	0,011	2649,429

Lancio n°100 Xp=-91,74 m yp=39,82 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-89,227	33,857	6,272	-5,408	0,838	2351,531
2,0	-86,877	31,142	6,775	-7,267	0,375	2522,771
3,0	-86,103	30,248	6,852	-7,742	0,114	2640,943
4,0	-85,861	29,968	6,793	-7,794	0,035	2631,841
5,0	-85,786	29,882	6,693	-7,715	0,011	2567,436

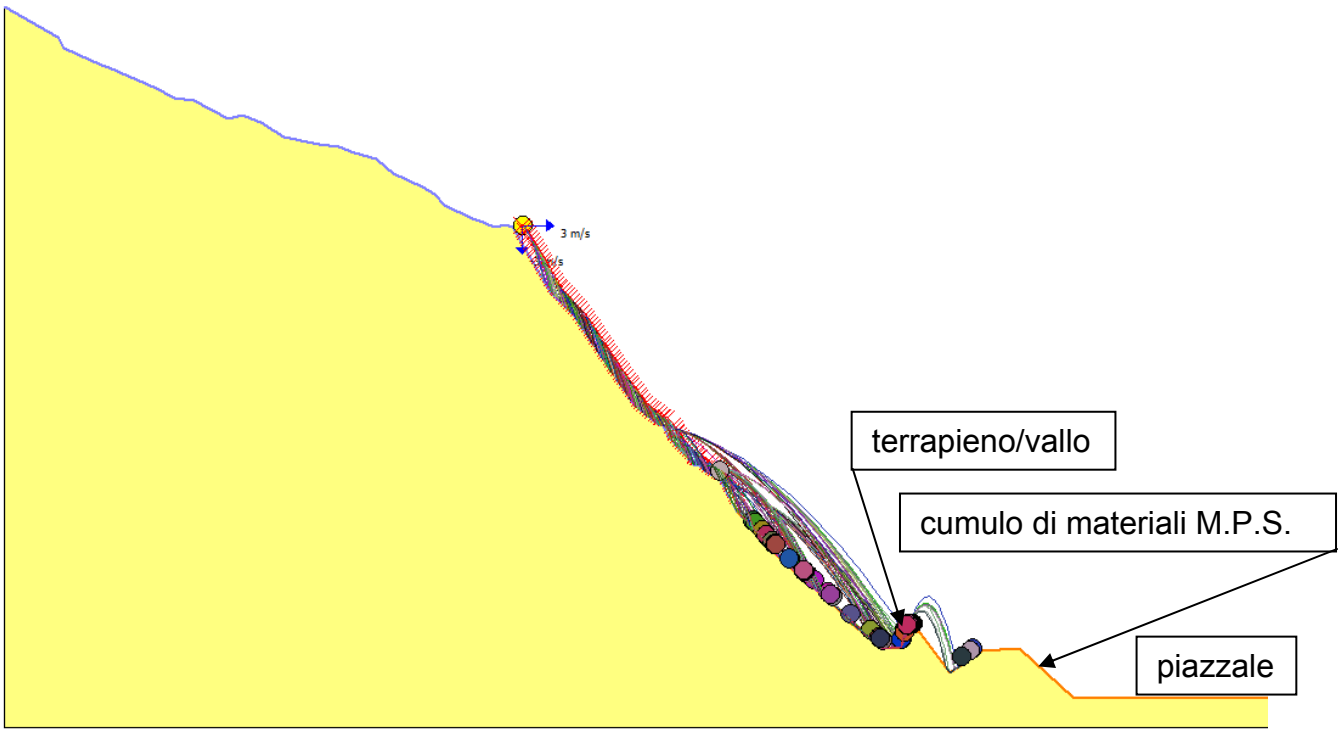
ELABORAZIONI STATISTICHE

Velocità massima	31,782	m/s
Velocità minima	0,315	m/s
Velocità media	13,066	m/s
Scarto quadratico medio	7,299	m/s
Energia massima pre-impatto	**18945,75**	**KJ**
Energia media pre-impatto	4640,479	KJ
Scarto quadratico energia	4029,155	KJ
Ascissa media di arresto	-71,159	m
Ascissa massima raggiunta	0,0	m

% Massi fermati

X (m)	% Massi fermati
-126,96	0
-105,96	3,076923
-84,96	20
-63,96	81
-42,96	100
-21,96	100

Simulazione “traiettografica” B



CARATTERISTICHE DEL BLOCCO

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Forma del blocco	Sferico
Densità	2400,0 Kg/m³
Elasticità	28635000,0 kPa
Velocità iniziale in x	3,0 m/s
Velocità iniziale in y	-3,0 m/s
Velocità limite di arresto	0,01 m/s
Diametro	3,0 m

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Massa	33929,2 Kg
Peso	33929,2 Kgf
Momento d'inerzia	30536,28 Kgxm2

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Elenco materiali

N	Descrizione	Rn	Rt	Texture
1	Roccia integra	0,9	0,8	
2	Roccia alterata	0,7	0,7	
3	Sabbia	0,4	0,6	
4	Detrito	0,6	0,6	
5	Detrito fino	0,32	0,82	
6	Detrito vegetato	0,29	0,8	
7	Detrito con arbusti	0,3	0,7	
8	Terreno o prato	0,31	0,79	
9	Superficie pavimentata	0,4	0,9	

DATI PENDIO

N	X (m)	Y (m)	Materiale
1	-211,39	123,9	Roccia alterata
2	-202,71	118,6	Roccia alterata
3	-201,6	116,85	Roccia alterata
4	-195,56	113,96	Roccia alterata
5	-194,35	113,37	Roccia alterata
6	-186,65	109,82	Roccia alterata
7	-183,69	108,16	Roccia alterata
8	-180,52	107,71	Roccia alterata
9	-174,9	104,77	Roccia alterata
10	-172,54	105,26	Roccia alterata
11	-169,52	104,05	Roccia alterata
12	-165,91	101,44	Roccia alterata
13	-160,18	100,21	Roccia alterata
14	-156,94	99,89	Roccia alterata
15	-154,46	98,79	Roccia alterata
16	-150,82	97,67	Roccia alterata
17	-148,02	95,27	Roccia alterata
18	-143,29	92,95	Roccia alterata
19	-141,25	91,65	Roccia alterata
20	-139,74	89,73	Roccia alterata
21	-135,26	87,5	Roccia alterata
22	-133,29	86,92	Roccia alterata
23	-131,52	85,96	Roccia alterata
24	-129,62	86,35	Roccia alterata
25	-128,53	86,07	Roccia alterata
26	-122,42	75,02	Roccia alterata
27	-118,78	71,02	Roccia alterata
28	-112,64	61,25	Roccia alterata
29	-109,54	56,72	Roccia alterata
30	-108,76	55,35	Roccia alterata
31	-105,14	52,24	Roccia alterata
32	-104,04	51,8	Roccia alterata
33	-103,03	49,77	Roccia alterata
34	-99,17	45,28	Roccia alterata
35	-98,05	45,06	Roccia alterata
36	-97,37	44,17	Roccia alterata
37	-94,9	42,67	Roccia alterata
38	-94,32	41,88	Roccia alterata
39	-93,38	39,72	Roccia alterata
40	-92,01	37,08	Terreno o prato
41	-84,7	28,62	Terreno o prato
42	-75,82	20,56	Terreno o prato
43	-73,54	17,99	Terreno o prato
44	-68,31	13,5	Terreno o prato
45	-65,27	13,68	Terreno o prato
46	-64,34	16,29	Terreno o prato
47	-62,37	16,35	Terreno o prato
48	-57,32	9,31	Terreno o prato
49	-52,24	13,13	Terreno o prato
50	-46,13	13,6	Terreno o prato
51	-37,34	5,14	Terreno o prato
52	-5,44	4,96	Terreno o prato

IMPATTO

Lancio n°1 Xp=-126,96 m yp=86,33 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-123,73	77,396	6,877	-7,603	1,078	3339,393
2,0	-120,76	73,198	9,308	-7,55	0,432	3856,367
3,0	-108,851	55,509	9,743	-14,386	1,279	9276,663
4,0	-108,725	55,321	14,197	-8,799	0,013	7221,58
5,0	-95,751	43,184	17,464	-6,887	0,914	10620,2
6,0	-64,661	15,38	2,77	10,534	1,78	17556,93
7,0	-57,434	9,47	8,231	-9,179	2,609	4779,142
8,0	-57,306	9,326	3,497	4,312	0,016	3645,997
9,0	-56,101	10,23	2,165	2,627	0,345	418,955
10,0	-55,657	10,562	1,321	1,66	0,205	160,312
11,0	-55,477	10,698	0,84	1,031	0,136	59,966
12,0	-55,408	10,749	0,52	0,655	0,082	24,154

Lancio n°2 Xp=-126,67 m yp=85,8 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-123,439	76,871	6,877	-7,603	1,078	3339,388
2,0	-120,82	73,264	9,034	-7,518	0,381	3659,702
3,0	-110,247	57,744	10,988	-12,48	1,17	8427,971
4,0	-107,4	54,182	14,526	-9,279	0,259	7724,309
5,0	-104,117	51,834	16,848	-3,681	0,226	7797,096
6,0	-64,449	15,977	3,042	11,28	2,354	18945,76
7,0	-56,14	10,201	4,502	4,984	2,731	5158,856
8,0	-54,663	11,308	2,488	3,19	0,328	691,48
9,0	-53,99	11,812	1,613	1,923	0,27	213,443
10,0	-53,756	11,988	0,966	1,241	0,146	88,838
11,0	-53,654	12,064	0,63	0,759	0,105	32,191

Lancio n°3 Xp=-126,38 m yp=85,28 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-123,148	76,346	6,877	-7,603	1,078	3339,393
2,0	-120,935	73,39	8,703	-7,487	0,322	3443,033
3,0	-111,612	59,741	10,502	-12,027	1,071	7659,433
4,0	-107,481	54,252	14,583	-8,916	0,393	7857,862
5,0	-85,253	29,266	15,588	-16,27	1,524	15204,24
6,0	-84,358	28,316	16,889	-14,551	0,057	12365,49
7,0	-81,634	25,841	16,84	-15,054	0,161	12624,59
8,0	-80,795	25,079	16,627	-15,03	0,05	12370,5
9,0	-80,539	24,846	16,361	-14,84	0,015	12008,82
10,0	-80,461	24,775	16,081	-14,601	0,005	11611,48

Lancio n°4 Xp=-126,09 m yp=84,75 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)

Lancio n°5 Xp=-125,8 m yp=84,23 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-122,567	75,296	6,877	-7,603	1,078	3339,388
2,0	-121,569	74,089	7,627	-7,411	0,145	2860,878

3,0	-120,015	72,376	7,952	-8,073	0,204	3252,994
4,0	-118,887	71,133	8,119	-8,467	0,142	3462,417
5,0	-111,82	60,045	10,173	-11,616	0,871	6957,686
6,0	-107,558	54,318	14,285	-8,627	0,419	7546,04
7,0	-86,001	30,13	15,303	-15,954	1,509	14612,61
8,0	-84,141	28,119	16,838	-14,356	0,122	12267,85
9,0	-80,912	25,185	16,829	-14,998	0,192	12602,0
10,0	-79,917	24,281	16,632	-15,02	0,059	12369,67
11,0	-79,612	24,005	16,371	-14,844	0,018	12020,03
12,0	-79,52	23,92	16,092	-14,61	0,006	11626,57

Lancio n°6 Xp=-125,51 m yp=83,7 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-122,305	74,901	8,355	-4,646	1,068	3296,182
2,0	-109,955	57,317	10,766	-11,65	1,478	7959,457
3,0	-107,188	54,0	13,846	-8,959	0,257	7044,431
4,0	-104,273	51,896	16,133	-3,451	0,211	7126,014
5,0	-65,001	14,428	3,149	11,621	2,434	18884,64
6,0	-56,477	9,948	4,469	4,978	2,707	4928,272
7,0	-54,993	11,06	2,485	3,176	0,332	681,225
8,0	-54,328	11,559	1,605	1,919	0,268	212,802
9,0	-54,093	11,735	0,965	1,236	0,146	88,02
10,0	-53,992	11,81	0,628	0,758	0,105	32,075

Lancio n°7 Xp=-125,22 m yp=83,18 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-122,075	74,648	8,278	-4,587	1,048	3205,884
2,0	-109,835	57,142	10,735	-11,58	1,479	7890,918
3,0	-107,213	54,021	13,724	-8,927	0,244	6923,673
4,0	-104,304	51,908	16,029	-3,401	0,212	7037,137
5,0	-65,078	14,209	3,164	11,671	2,447	18873,59
6,0	-56,524	9,913	4,465	4,978	2,703	4896,703
7,0	-55,039	11,026	2,485	3,175	0,333	680,084
8,0	-54,374	11,524	1,605	1,919	0,267	212,776
9,0	-54,14	11,7	0,965	1,235	0,146	87,933
10,0	-54,039	11,775	0,627	0,758	0,104	32,066

Lancio n°8 Xp=-124,93 m yp=82,65 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-121,846	74,395	8,199	-4,528	1,027	3115,127
2,0	-109,727	56,984	10,699	-11,506	1,478	7816,413
3,0	-107,24	54,044	13,601	-8,893	0,232	6804,438
4,0	-104,334	51,92	15,923	-3,351	0,214	6947,659
5,0	-65,158	13,984	3,18	11,721	2,46	18863,86
6,0	-56,572	9,876	4,462	4,978	2,7	4864,453
7,0	-55,086	10,99	2,485	3,173	0,333	678,977
8,0	-54,422	11,488	1,604	1,919	0,267	212,761
9,0	-54,188	11,664	0,965	1,235	0,146	87,851
10,0	-54,087	11,739	0,627	0,758	0,104	32,061

Lancio n°9 Xp=-124,64 m yp=82,13 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-121,619	74,145	8,116	-4,469	1,006	3023,889

2,0	-109,632	56,845	10,659	-11,428	1,477	7735,661
3,0	-107,266	54,066	13,478	-8,855	0,222	6687,228
4,0	-104,363	51,932	15,816	-3,301	0,215	6857,665
5,0	-65,24	13,754	3,196	11,773	2,474	18855,73
6,0	-56,622	9,839	4,458	4,978	2,696	4831,534
7,0	-55,135	10,954	2,485	3,172	0,334	677,909
8,0	-54,472	11,451	1,603	1,919	0,267	212,761
9,0	-54,237	11,627	0,965	1,235	0,146	87,773
10,0	-54,137	11,702	0,627	0,758	0,104	32,058

Lancio n°10 Xp=-124,35 m yp=81,6 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-121,393	73,896	8,031	-4,41	0,985	2932,135
2,0	-109,55	56,725	10,614	-11,345	1,475	7648,331
3,0	-107,29	54,088	13,356	-8,813	0,213	6572,587
4,0	-104,39	51,943	15,708	-3,252	0,217	6767,267
5,0	-65,41	13,668	10,142	1,401	2,482	18799,56
6,0	-65,264	13,687	0,337	5,154	0,014	2478,419
7,0	-64,975	14,499	0,732	3,33	0,858	349,74
8,0	-64,785	15,033	0,322	1,774	0,26	97,088
9,0	-64,728	15,193	0,22	0,91	0,177	23,25

Lancio n°11 Xp=-124,06 m yp=81,08 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-121,168	73,648	7,942	-4,35	0,962	2839,83
2,0	-109,453	56,558	9,095	-12,608	1,475	7576,417
3,0	-108,415	55,055	13,243	-8,055	0,114	6222,173
4,0	-96,207	43,461	16,537	-6,33	0,922	9521,709
5,0	-65,089	14,18	2,848	10,816	1,882	17124,97
6,0	-57,869	10,077	8,01	-8,96	2,535	4330,657
7,0	-57,257	9,363	3,358	4,201	0,076	3656,784
8,0	-56,104	10,228	2,113	2,54	0,343	387,014
9,0	-55,692	10,536	1,276	1,617	0,195	152,496
10,0	-55,52	10,665	0,82	0,998	0,135	56,029
11,0	-55,456	10,713	0,503	0,638	0,078	22,975

Lancio n°12 Xp=-123,77 m yp=80,55 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)

Lancio n°13 Xp=-123,47 m yp=80,03 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-120,725	73,159	7,753	-4,23	0,917	2653,399
2,0	-109,324	56,333	9,037	-12,416	1,47	7395,766
3,0	-108,448	55,083	13,005	-7,962	0,097	5998,374
4,0	-96,515	43,647	16,335	-6,208	0,918	9288,225
5,0	-65,234	13,773	2,88	10,916	1,915	17128,53
6,0	-58,005	10,267	7,93	-8,884	2,51	4187,964
7,0	-57,246	9,371	3,313	4,166	0,096	3655,009
8,0	-56,11	10,223	2,096	2,511	0,343	376,988
9,0	-55,708	10,524	1,262	1,604	0,192	150,059
10,0	-55,539	10,651	0,813	0,987	0,134	54,776
11,0	-55,476	10,698	0,498	0,632	0,077	22,604

Lancio n°14 Xp=-123,18 m yp=79,5 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-120,505	72,917	7,652	-4,169	0,893	2559,177
2,0	-109,295	56,283	8,993	-12,306	1,465	7284,33
3,0	-108,453	55,088	12,895	-7,907	0,094	5896,296
4,0	-96,634	43,719	16,239	-6,149	0,917	9178,592
5,0	-65,351	13,671	11,043	1,516	1,926	17094,87
6,0	-65,266	13,682	0,463	5,459	0,008	2941,538
7,0	-64,874	14,784	0,708	3,248	0,848	332,858
8,0	-64,692	15,295	0,317	1,724	0,257	91,219
9,0	-64,638	15,446	0,211	0,885	0,17	22,09

Lancio n°15 Xp=-122,89 m yp=78,98 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-120,288	72,677	7,547	-4,109	0,868	2464,208
2,0	-109,292	56,277	8,939	-12,185	1,457	7158,057
3,0	-108,449	55,084	12,794	-7,846	0,094	5801,771
4,0	-104,052	51,809	15,157	-2,914	0,344	6400,833
5,0	-66,029	13,632	9,766	1,383	2,509	18308,83
6,0	-65,256	13,711	0,346	5,193	0,079	2279,878
7,0	-64,958	14,547	0,733	3,337	0,861	351,443
8,0	-64,767	15,083	0,323	1,777	0,261	97,417
9,0	-64,71	15,244	0,221	0,911	0,178	23,335

Lancio n°16 Xp=-122,6 m yp=78,45 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-120,073	72,44	7,436	-4,048	0,843	2368,419
2,0	-109,315	56,317	8,873	-12,053	1,447	7016,174
3,0	-108,433	55,07	12,703	-7,777	0,099	5715,377
4,0	-104,06	51,812	15,057	-2,88	0,344	6314,819
5,0	-66,234	13,621	9,696	1,379	2,512	18237,22
6,0	-65,256	13,71	0,36	5,234	0,101	2243,79
7,0	-64,946	14,581	0,731	3,331	0,861	350,338
8,0	-64,756	15,116	0,323	1,773	0,261	96,913
9,0	-64,699	15,276	0,22	0,909	0,177	23,25

Lancio n°17 Xp=-122,31 m yp=77,93 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-119,861	72,206	7,319	-3,987	0,817	2271,741
2,0	-109,366	56,406	8,794	-11,908	1,434	6857,783
3,0	-108,405	55,046	12,622	-7,7	0,109	5637,411
4,0	-104,055	51,81	14,96	-2,85	0,345	6230,619
5,0	-66,427	13,61	9,629	1,375	2,515	18167,37
6,0	-65,258	13,705	0,375	5,277	0,121	2210,83
7,0	-64,935	14,612	0,729	3,325	0,861	349,099
8,0	-64,745	15,145	0,322	1,769	0,261	96,383
9,0	-64,688	15,305	0,218	0,907	0,176	23,157

Lancio n°18 Xp=-122,02 m yp=77,41 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-119,651	71,974	7,196	-3,926	0,79	2174,075

2,0	-109,447	56,547	8,702	-11,749	1,418	6681,814
3,0	-108,367	55,014	12,551	-7,614	0,124	5567,849
4,0	-96,786	43,811	15,9	-5,946	0,923	8807,705
5,0	-65,829	13,644	10,8	1,503	1,947	16817,92
6,0	-65,256	13,71	0,466	5,493	0,053	2796,753
7,0	-64,858	14,827	0,711	3,264	0,853	336,534
8,0	-64,675	15,343	0,319	1,733	0,258	92,169
9,0	-64,62	15,495	0,212	0,89	0,171	22,313

Lancio n°19 Xp=-121,73 m yp=76,88 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-119,444	71,746	7,066	-3,864	0,762	2075,315
2,0	-109,555	56,733	9,946	-10,318	1,399	6490,352
3,0	-107,189	54,0	12,502	-8,18	0,238	5748,735
4,0	-104,435	51,96	14,759	-2,949	0,22	5954,807
5,0	-67,338	13,558	9,482	1,365	2,514	18112,55
6,0	-65,738	13,649	9,276	0,78	0,169	2144,917
7,0	-65,268	13,676	0,307	5,082	0,051	2048,668
8,0	-65,005	14,417	0,74	3,357	0,861	355,38
9,0	-64,812	14,958	0,323	1,79	0,261	99,111
10,0	-64,754	15,121	0,224	0,918	0,18	23,645

Lancio n°20 Xp=-121,44 m yp=76,36 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-119,24	71,522	6,928	-3,803	0,733	1975,331
2,0	-109,663	56,891	9,831	-10,159	1,382	6308,188
3,0	-107,136	53,955	12,445	-8,068	0,257	5685,486
4,0	-104,405	51,949	14,657	-2,938	0,219	5865,188
5,0	-67,549	13,546	9,413	1,361	2,515	18040,87
6,0	-65,961	13,636	9,208	0,776	0,169	2113,609
7,0	-65,483	13,663	9,0	0,753	0,052	2018,428
8,0	-65,267	13,679	0,238	4,885	0,024	1931,755
9,0	-65,063	14,253	0,755	3,397	0,86	363,36
10,0	-64,866	14,804	0,324	1,818	0,26	102,646
11,0	-64,806	14,973	0,23	0,931	0,184	24,299

Lancio n°21 Xp=-121,15 m yp=75,83 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-119,04	71,302	6,78	-3,742	0,703	1873,958
2,0	-109,8	57,09	9,704	-9,988	1,363	6111,72
3,0	-107,082	53,908	12,393	-7,945	0,28	5626,767
4,0	-104,369	51,934	14,554	-2,93	0,219	5775,342
5,0	-67,762	13,534	9,342	1,358	2,515	17968,55
6,0	-66,185	13,624	9,139	0,773	0,169	2082,307
7,0	-65,711	13,65	8,933	0,747	0,052	1988,313
8,0	-65,273	13,675	8,731	0,733	0,049	1899,747

Lancio n°22 Xp=-120,96 m yp=75,65 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-118,843	71,084	6,801	-3,75	0,707	1887,879
2,0	-109,456	56,562	8,486	-11,293	1,38	6222,792
3,0	-108,336	54,987	12,191	-7,379	0,132	5242,97
4,0	-104,094	51,825	14,488	-2,69	0,348	5837,74

5,0	-67,405	13,554	9,299	1,357	2,532	17840,5
6,0	-65,832	13,644	9,096	0,771	0,169	2063,075
7,0	-65,359	13,67	8,891	0,743	0,052	1969,745
8,0	-65,268	13,678	0,208	4,798	0,01	1887,894
9,0	-65,089	14,179	0,762	3,417	0,859	367,488
10,0	-64,891	14,736	0,325	1,832	0,26	104,481
11,0	-64,83	14,907	0,234	0,938	0,187	24,639

Lancio n°23 Xp=-120,56 m yp=75,21 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-118,346	70,323	5,799	-5,75	0,738	1993,199
2,0	-114,237	63,785	7,123	-8,995	0,709	3736,656
3,0	-111,418	59,458	8,181	-10,284	0,396	4556,557
4,0	-108,455	55,089	12,444	-7,09	0,362	5549,16
5,0	-96,346	43,545	15,7	-5,822	0,973	8663,329
6,0	-65,796	13,646	10,682	1,5	1,946	16543,47
7,0	-65,256	13,709	0,446	5,44	0,051	2736,871
8,0	-64,876	14,778	0,714	3,274	0,854	338,423
9,0	-64,691	15,297	0,319	1,738	0,259	92,812
10,0	-64,636	15,45	0,213	0,892	0,172	22,434

Lancio n°24 Xp=-120,16 m yp=74,77 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-117,838	69,515	5,979	-5,863	0,773	2114,158
2,0	-113,389	62,436	7,354	-9,255	0,744	3996,019
3,0	-110,739	58,464	8,146	-10,514	0,36	4629,451
4,0	-108,401	55,043	12,273	-7,083	0,287	5335,673
5,0	-96,603	43,701	15,564	-5,741	0,961	8497,008
6,0	-66,111	13,628	10,574	1,493	1,959	16478,26
7,0	-65,254	13,717	0,46	5,491	0,081	2673,633
8,0	-64,86	14,823	0,714	3,278	0,856	339,369
9,0	-64,675	15,343	0,32	1,74	0,259	92,953
10,0	-64,62	15,497	0,213	0,893	0,171	22,488

Lancio n°25 Xp=-119,75 m yp=74,32 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-117,336	68,716	6,147	-5,971	0,806	2232,028
2,0	-112,577	61,153	8,154	-8,961	0,774	4233,759
3,0	-108,133	54,812	12,277	-6,821	0,545	5577,581
4,0	-96,073	43,38	15,493	-5,702	0,982	8435,89
5,0	-65,881	13,641	10,55	1,495	1,949	16303,96
6,0	-65,255	13,712	0,434	5,415	0,059	2667,147
7,0	-64,884	14,755	0,716	3,283	0,855	340,333
8,0	-64,698	15,277	0,32	1,744	0,259	93,418
9,0	-64,643	15,431	0,214	0,895	0,172	22,565

Lancio n°26 Xp=-119,35 m yp=73,88 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-116,839	67,926	6,303	-6,075	0,837	2347,276
2,0	-111,913	60,181	8,247	-9,126	0,782	4367,892
3,0	-107,939	54,646	12,183	-6,877	0,482	5417,158
4,0	-96,189	43,45	15,421	-5,662	0,964	8324,189
5,0	-66,041	13,632	10,493	1,491	1,955	16266,67

6,0	-65,254	13,716	0,442	5,441	0,075	2634,386
7,0	-64,876	14,778	0,717	3,284	0,856	340,714
8,0	-64,69	15,3	0,32	1,744	0,259	93,457
9,0	-64,635	15,455	0,214	0,895	0,172	22,581

Lancio n°27 Xp=-118,95 m yp=73,43 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-116,346	67,142	6,45	-6,176	0,867	2460,252
2,0	-111,267	59,237	8,331	-9,28	0,787	4493,002
3,0	-107,801	54,527	12,053	-6,935	0,416	5243,4
4,0	-96,398	43,577	15,325	-5,608	0,946	8191,604
5,0	-66,284	13,618	10,416	1,486	1,965	16229,57
6,0	-65,254	13,717	0,456	5,487	0,099	2591,0
7,0	-64,863	14,815	0,716	3,285	0,858	341,016
8,0	-64,677	15,337	0,321	1,744	0,26	93,423
9,0	-64,622	15,492	0,213	0,895	0,172	22,588

Lancio n°28 Xp=-118,54 m yp=72,99 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-115,857	66,364	6,589	-6,274	0,896	2571,252
2,0	-110,639	58,319	8,407	-9,425	0,792	4609,777
3,0	-107,724	54,461	11,882	-6,995	0,347	5054,408
4,0	-96,716	43,769	15,203	-5,535	0,927	8033,357
5,0	-66,626	13,599	10,315	1,479	1,979	16191,93
6,0	-65,257	13,708	0,48	5,562	0,133	2536,946
7,0	-64,844	14,867	0,716	3,285	0,859	341,125
8,0	-64,658	15,39	0,321	1,743	0,26	93,29
9,0	-64,603	15,544	0,213	0,895	0,172	22,581

Lancio n°29 Xp=-118,14 m yp=72,54 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-115,372	65,591	6,72	-6,37	0,923	2680,497
2,0	-110,027	57,424	8,475	-9,561	0,795	4718,755
3,0	-107,721	54,458	11,655	-7,061	0,272	4846,851
4,0	-104,179	51,859	13,805	-2,56	0,304	5240,899
5,0	-69,549	14,57	16,341	-12,204	2,509	17043,45
6,0	-68,177	13,511	14,212	2,107	0,084	10219,35
7,0	-65,247	13,737	1,095	7,005	0,206	4815,943
8,0	-64,369	16,2	0,791	3,415	0,801	362,074
9,0	-63,844	16,306	1,848	0,926	0,664	255,555
10,0	-63,518	16,317	1,794	0,324	0,177	92,875
11,0	-63,42	16,32	1,756	0,139	0,054	77,407

Lancio n°30 Xp=-117,74 m yp=72,1 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-114,889	64,823	6,845	-6,463	0,95	2788,176
2,0	-109,341	56,362	7,191	-10,828	0,811	4883,306
3,0	-108,625	55,235	11,253	-6,446	0,1	4382,732
4,0	-104,057	51,81	13,48	-2,29	0,406	5093,877
5,0	-70,209	15,136	16,092	-11,992	2,511	16592,66
6,0	-68,139	13,513	13,942	2,084	0,129	10093,07
7,0	-65,248	13,734	1,059	6,931	0,207	4634,764
8,0	-64,393	16,133	0,779	3,388	0,807	357,12

9,0	-63,898	16,305	1,836	0,87	0,636	228,84
10,0	-63,595	16,314	1,784	0,307	0,165	90,359
11,0	-63,504	16,317	1,747	0,134	0,051	76,45

Lancio n°31 Xp=-117,25 m yp=71,39 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-114,366	63,992	6,892	-6,498	0,96	2829,823
2,0	-108,673	55,277	11,266	-5,689	0,826	4993,32
3,0	-96,783	43,81	14,512	-5,095	1,055	7537,705
4,0	-67,495	13,549	9,823	1,453	2,018	15622,34
5,0	-65,699	13,651	9,607	0,82	0,183	2302,414
6,0	-65,267	13,678	0,344	5,189	0,045	2198,341
7,0	-64,971	14,51	0,734	3,339	0,861	351,906
8,0	-64,78	15,047	0,323	1,778	0,261	97,569
9,0	-64,723	15,208	0,221	0,912	0,177	23,372

Lancio n°32 Xp=-116,93 m yp=70,88 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-114,047	63,484	6,892	-6,498	0,96	2829,827
2,0	-108,542	55,165	11,175	-5,651	0,799	4861,722
3,0	-96,812	43,827	14,426	-5,045	1,05	7436,963
4,0	-67,625	13,542	9,76	1,45	2,023	15559,3
5,0	-65,841	13,643	9,545	0,816	0,183	2273,154
6,0	-65,305	13,673	9,33	0,777	0,056	2168,99

Lancio n°33 Xp=-116,61 m yp=70,38 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-113,728	62,976	6,892	-6,498	0,96	2829,827
2,0	-108,418	55,057	11,078	-5,616	0,77	4728,349
3,0	-96,856	43,854	14,335	-4,992	1,044	7333,097
4,0	-67,77	13,534	9,694	1,446	2,029	15496,95
5,0	-65,998	13,634	9,48	0,813	0,183	2242,51
6,0	-65,466	13,664	9,267	0,771	0,056	2139,522
7,0	-65,267	13,679	0,272	4,985	0,021	2048,54
8,0	-65,033	14,336	0,748	3,378	0,861	359,719
9,0	-64,838	14,883	0,324	1,805	0,261	100,937
10,0	-64,779	15,049	0,228	0,925	0,183	23,984

Lancio n°34 Xp=-116,29 m yp=69,87 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-113,408	62,468	6,892	-6,498	0,96	2829,825
2,0	-108,3	54,956	10,975	-5,582	0,741	4593,004
3,0	-96,917	43,891	14,241	-4,937	1,037	7225,72
4,0	-67,933	13,525	9,623	1,442	2,035	15435,35
5,0	-66,173	13,624	9,411	0,809	0,183	2210,327
6,0	-65,645	13,654	9,2	0,765	0,056	2108,578
7,0	-65,268	13,677	0,286	5,022	0,041	2015,984
8,0	-65,022	14,367	0,744	3,368	0,86	357,677
9,0	-64,828	14,912	0,323	1,798	0,26	100,111
10,0	-64,77	15,076	0,226	0,922	0,181	23,829

Lancio n°35 Xp=-115,97 m yp=69,36 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-113,089	61,96	6,892	-6,498	0,96	2829,823
2,0	-108,19	54,861	10,865	-5,549	0,711	4455,474
3,0	-96,997	43,939	14,142	-4,879	1,03	7114,36
4,0	-68,114	13,514	9,549	1,438	2,042	15374,59
5,0	-66,368	13,613	9,338	0,805	0,183	2176,42
6,0	-65,844	13,643	9,129	0,758	0,056	2075,982
7,0	-65,396	13,668	8,922	0,75	0,049	1984,015
8,0	-65,267	13,678	0,216	4,822	0,014	1900,271
9,0	-65,082	14,199	0,76	3,411	0,859	366,325
10,0	-64,884	14,755	0,325	1,828	0,26	103,963
11,0	-64,823	14,925	0,233	0,936	0,186	24,543

Lancio n°36 Xp=-115,65 m yp=68,85 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-112,77	61,452	6,892	-6,498	0,96	2829,823
2,0	-108,088	54,774	10,747	-5,519	0,679	4315,485
3,0	-97,098	44,001	14,037	-4,818	1,023	6998,465
4,0	-68,329	13,524	16,315	-12,134	2,049	15307,66

Lancio n°37 Xp=-115,33 m yp=68,34 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-112,46	60,981	7,198	-6,027	0,957	2817,281
2,0	-107,253	54,056	10,765	-5,612	0,723	4354,397
3,0	-96,6	43,699	14,013	-4,821	0,99	6895,758
4,0	-68,051	13,518	9,474	1,437	2,037	15194,36
5,0	-66,313	13,616	9,264	0,801	0,183	2142,677
6,0	-65,792	13,646	9,057	0,752	0,056	2043,404
7,0	-65,352	13,671	8,852	0,744	0,049	1953,026
8,0	-65,268	13,677	0,201	4,779	0,01	1871,583
9,0	-65,095	14,162	0,764	3,421	0,859	368,32
10,0	-64,896	14,72	0,325	1,835	0,26	104,875
11,0	-64,835	14,892	0,234	0,939	0,187	24,712

Lancio n°38 Xp=-115,01 m yp=67,84 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-112,156	60,537	7,174	-6,01	0,952	2796,151
2,0	-107,162	53,977	10,638	-5,575	0,696	4220,041
3,0	-96,711	43,766	13,899	-4,755	0,982	6774,682
4,0	-68,273	13,505	9,388	1,432	2,046	15130,8
5,0	-66,551	13,603	9,18	0,796	0,183	2104,046
6,0	-66,034	13,632	8,975	0,744	0,056	2006,275
7,0	-65,604	13,657	8,771	0,738	0,048	1917,66
8,0	-65,268	13,678	0,224	4,836	0,038	1832,858
9,0	-65,076	14,217	0,757	3,399	0,858	363,674
10,0	-64,879	14,769	0,324	1,821	0,26	103,047
11,0	-64,819	14,938	0,232	0,933	0,186	24,355

Lancio n°39 Xp=-114,69 m yp=67,33 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-111,852	60,092	7,151	-5,993	0,947	2774,971
2,0	-107,078	53,905	10,503	-5,54	0,668	4083,69

3,0	-96,84	43,844	13,781	-4,685	0,975	6649,571
4,0	-68,719	13,858	16,113	-11,96	2,041	14946,0
5,0	-68,251	13,506	14,212	2,136	0,029	9666,633
6,0	-65,246	13,739	1,098	7,014	0,211	4816,405
7,0	-64,366	16,21	0,792	3,419	0,801	362,891
8,0	-63,837	16,307	1,849	0,934	0,668	259,349
9,0	-63,507	16,317	1,795	0,327	0,178	93,216
10,0	-63,409	16,32	1,757	0,14	0,055	77,535

Lancio n°40 Xp=-114,37 m yp=66,82 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-111,548	59,648	7,127	-5,975	0,942	2753,737
2,0	-107,001	53,839	10,358	-5,507	0,638	3945,071
3,0	-96,99	43,936	13,656	-4,612	0,966	6519,904
4,0	-69,237	14,302	16,007	-11,869	2,032	14730,98
5,0	-68,196	13,51	14,055	2,118	0,065	9681,338
6,0	-65,246	13,738	1,074	6,964	0,21	4710,133
7,0	-64,382	16,166	0,784	3,4	0,805	359,299
8,0	-63,872	16,305	1,841	0,898	0,649	241,667
9,0	-63,558	16,316	1,788	0,316	0,171	91,51
10,0	-63,464	16,319	1,75	0,136	0,053	76,837

Lancio n°41 Xp=-114,05 m yp=66,31 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-111,245	59,204	7,102	-5,958	0,936	2732,457
2,0	-106,934	53,781	10,204	-5,477	0,607	3803,831
3,0	-97,165	44,041	13,524	-4,534	0,957	6385,039
4,0	-69,8	14,786	15,895	-11,772	2,023	14503,17
5,0	-68,152	13,512	13,887	2,098	0,104	9702,213
6,0	-65,247	13,736	1,05	6,914	0,209	4598,208
7,0	-64,398	16,12	0,776	3,382	0,808	356,02
8,0	-63,909	16,304	1,834	0,858	0,63	223,674
9,0	-63,61	16,314	1,782	0,303	0,163	89,829
10,0	-63,521	16,317	1,745	0,133	0,05	76,233

Lancio n°42 Xp=-113,73 m yp=65,8 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-110,941	58,76	7,078	-5,941	0,931	2711,129
2,0	-106,877	53,733	10,037	-5,451	0,574	3659,529
3,0	-104,05	51,808	11,69	-2,132	0,282	3699,799
4,0	-77,86	22,412	14,579	-11,338	2,24	13101,05
5,0	-70,3	15,215	15,708	-12,377	0,519	10483,55
6,0	-68,24	13,507	13,569	2,048	0,131	10062,34
7,0	-65,252	13,72	0,995	6,785	0,22	4390,575
8,0	-64,443	15,994	0,758	3,34	0,814	348,158
9,0	-64,01	16,301	1,82	0,727	0,571	175,23
10,0	-63,762	16,309	1,772	0,263	0,136	85,527
11,0	-63,688	16,311	1,736	0,12	0,042	75,111

Lancio n°43 Xp=-113,41 m yp=65,3 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-110,638	58,317	7,053	-5,924	0,926	2689,744
2,0	-106,834	53,695	9,856	-5,429	0,539	3511,577

3,0	-104,136	51,842	11,518	-2,076	0,274	3587,737
4,0	-78,562	23,05	14,432	-11,203	2,22	12799,89
5,0	-70,933	15,758	15,595	-12,259	0,529	10341,01
6,0	-68,254	13,506	13,401	2,028	0,172	10089,72
7,0	-65,254	13,715	0,962	6,709	0,224	4282,681
8,0	-64,468	15,922	0,749	3,318	0,817	344,016
9,0	-64,07	16,299	1,814	0,63	0,532	148,168
10,0	-63,859	16,306	1,769	0,234	0,116	83,133
11,0	-63,795	16,308	1,733	0,111	0,036	74,692

Lancio n°44 Xp=-113,1 m yp=64,79 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-110,335	57,873	7,029	-5,906	0,92	2668,317
2,0	-106,805	53,671	9,658	-5,411	0,502	3359,175
3,0	-104,231	51,879	11,338	-2,008	0,267	3474,167
4,0	-79,274	23,697	14,278	-11,062	2,201	12493,11
5,0	-71,583	16,315	15,475	-12,136	0,539	10191,26
6,0	-68,284	13,505	13,228	2,008	0,213	10116,02
7,0	-65,257	13,707	0,928	6,626	0,229	4173,278
8,0	-64,497	15,843	0,739	3,296	0,82	339,968
9,0	-64,143	16,297	1,812	0,489	0,479	118,793
10,0	-63,984	16,302	1,77	0,19	0,088	80,688

Lancio n°45 Xp=-112,78 m yp=64,28 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-110,031	57,429	7,003	-5,889	0,915	2646,829
2,0	-106,796	53,663	9,437	-5,399	0,462	3201,201
3,0	-104,335	51,921	11,15	-1,925	0,261	3358,755
4,0	-80,0	24,356	14,116	-10,914	2,182	12179,17
5,0	-72,253	16,89	15,347	-12,007	0,549	10033,11
6,0	-68,63	13,782	15,425	-12,877	0,236	10047,95
7,0	-68,299	13,504	13,538	2,069	0,021	9681,289
8,0	-65,252	13,721	0,987	6,765	0,225	4370,795
9,0	-64,449	15,977	0,755	3,334	0,814	346,915
10,0	-64,024	16,3	1,818	0,706	0,563	168,832
11,0	-63,784	16,308	1,77	0,257	0,132	84,909
12,0	-63,712	16,311	1,734	0,118	0,041	74,944

Lancio n°46 Xp=-112,46 m yp=63,77 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-109,728	56,986	6,978	-5,871	0,91	2625,286
2,0	-106,813	53,677	9,188	-5,395	0,418	3035,958
3,0	-104,453	51,967	10,951	-1,824	0,257	3240,943
4,0	-80,746	25,034	13,945	-10,758	2,165	11854,9
5,0	-72,952	17,489	15,211	-11,871	0,559	9864,604
6,0	-69,3	14,357	15,297	-12,761	0,24	9879,296
7,0	-68,302	13,504	13,35	2,047	0,065	9708,208
8,0	-65,254	13,715	0,952	6,683	0,228	4250,636
9,0	-64,476	15,9	0,746	3,311	0,818	342,683
10,0	-64,089	16,298	1,813	0,596	0,519	140,016
11,0	-63,891	16,305	1,768	0,223	0,11	82,393
12,0	-63,831	16,307	1,733	0,107	0,034	74,578

Lancio n°47 Xp=-112,14 m yp=63,26 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-109,41	56,484	6,258	-6,775	0,909	2623,519
2,0	-107,983	54,684	8,613	-5,078	0,228	2590,838
3,0	-104,748	52,085	10,74	-1,367	0,376	3218,146
4,0	-81,151	25,403	13,772	-10,601	2,197	11615,99
5,0	-73,373	17,851	15,06	-11,732	0,565	9673,946
6,0	-69,726	14,722	15,152	-12,634	0,242	9691,772
7,0	-68,599	13,755	15,01	-12,763	0,074	9564,982
8,0	-68,305	13,503	13,238	2,057	0,02	9303,47
9,0	-65,254	13,717	0,933	6,642	0,23	4180,112
10,0	-64,488	15,866	0,741	3,301	0,82	340,916
11,0	-64,121	16,297	1,811	0,535	0,495	127,075
12,0	-63,945	16,303	1,768	0,204	0,097	81,285
13,0	-63,892	16,305	1,733	0,102	0,03	74,501

Lancio n°48 Xp=-111,82 m yp=62,76 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-109,069	55,889	6,293	-6,802	0,916	2652,261
2,0	-108,233	54,898	8,086	-5,158	0,133	2340,173
3,0	-105,272	52,352	8,775	-6,316	0,366	3019,625
4,0	-105,093	52,221	10,276	-2,131	0,02	2813,763
5,0	-84,66	28,59	13,301	-10,169	1,988	10459,32
6,0	-79,47	23,875	13,603	-11,778	0,39	8213,697
7,0	-77,863	22,416	13,558	-12,137	0,118	8174,245
8,0	-77,368	21,965	13,382	-12,101	0,037	8013,922
9,0	-77,216	21,828	13,166	-11,943	0,011	7777,005

Lancio n°49 Xp=-111,5 m yp=62,25 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-108,738	55,333	7,943	-2,734	0,92	2668,414
2,0	-99,751	45,961	9,545	-8,197	1,131	4729,8
3,0	-98,953	45,241	11,465	0,907	0,084	3974,623
4,0	-68,976	14,079	14,5	-10,614	2,615	13448,5
5,0	-68,215	13,508	13,059	2,11	0,052	7845,947
6,0	-65,247	13,735	0,916	6,612	0,227	4068,106
7,0	-64,493	15,853	0,738	3,298	0,824	340,647
8,0	-64,134	16,297	1,811	0,511	0,486	122,43
9,0	-63,967	16,302	1,768	0,197	0,092	80,863
10,0	-63,917	16,304	1,733	0,099	0,028	74,457

Lancio n°50 Xp=-111,2 m yp=61,8 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-108,501	55,129	7,867	-2,691	0,9	2585,662
2,0	-99,566	45,745	9,532	-8,137	1,136	4700,478
3,0	-99,007	45,251	11,4	0,882	0,059	3870,042
4,0	-69,387	14,431	14,442	-10,562	2,598	13300,25
5,0	-68,176	13,511	12,949	2,096	0,084	7896,496
6,0	-65,248	13,734	0,899	6,573	0,226	4000,06
7,0	-64,506	15,817	0,734	3,29	0,826	339,31
8,0	-64,17	16,296	1,811	0,431	0,458	109,503
9,0	-64,032	16,3	1,771	0,172	0,076	79,922

Lancio n°51 Xp=-110,86 m yp=61,3 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-108,23	54,896	7,784	-2,646	0,877	2498,542
2,0	-99,349	45,493	9,521	-8,074	1,141	4671,063
3,0	-99,087	45,267	11,325	0,842	0,028	3750,701
4,0	-69,91	14,88	14,372	-10,499	2,576	13116,05
5,0	-68,14	13,513	12,814	2,078	0,123	7966,051
6,0	-65,248	13,732	0,876	6,521	0,226	3917,203
7,0	-64,523	15,769	0,73	3,281	0,828	337,658
8,0	-64,34	16,283	0,313	1,759	0,251	95,892
9,0	-64,229	16,294	0,927	0,542	0,353	71,794
10,0	-64,132	16,297	0,898	0,187	0,104	24,561

Lancio n°52 Xp=-110,52 m yp=60,81 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-107,96	54,663	7,698	-2,602	0,854	2410,947
2,0	-99,161	45,281	9,361	1,306	1,143	4627,967
3,0	-77,531	22,114	12,639	-9,57	2,311	9768,654
4,0	-70,855	15,691	13,832	-10,769	0,528	8093,727
5,0	-68,269	13,505	12,207	2,014	0,187	8021,154
6,0	-65,258	13,704	0,751	6,211	0,247	3557,732
7,0	-64,63	15,468	0,71	3,237	0,837	329,841
8,0	-64,45	15,973	0,314	1,724	0,254	91,405
9,0	-64,396	16,124	0,213	0,885	0,172	21,991

Lancio n°53 Xp=-110,18 m yp=60,31 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-107,692	54,433	7,608	-2,558	0,831	2322,836
2,0	-99,088	45,267	9,265	1,335	1,131	4518,838
3,0	-77,742	22,306	12,564	-9,501	2,304	9658,786
4,0	-71,065	15,871	13,769	-10,709	0,531	8021,394
5,0	-68,281	13,505	12,132	2,007	0,202	8009,12
6,0	-65,26	13,7	0,736	6,174	0,249	3514,378
7,0	-64,643	15,43	0,708	3,234	0,838	329,378
8,0	-64,464	15,935	0,314	1,721	0,254	91,075
9,0	-64,41	16,086	0,212	0,883	0,171	21,944

Lancio n°54 Xp=-109,85 m yp=59,82 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-107,426	54,204	7,513	-2,514	0,807	2234,167
2,0	-99,021	45,254	9,164	1,364	1,119	4409,003
3,0	-77,975	22,517	12,485	-9,429	2,297	9541,714
4,0	-71,296	16,069	13,703	-10,645	0,535	7946,179
5,0	-68,297	13,504	12,051	1,999	0,219	7999,862
6,0	-65,261	13,696	0,719	6,132	0,252	3468,618
7,0	-64,658	15,389	0,707	3,231	0,839	328,945
8,0	-64,479	15,894	0,314	1,719	0,254	90,762
9,0	-64,425	16,044	0,212	0,882	0,17	21,901

Lancio n°55 Xp=-109,51 m yp=59,32 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-107,162	53,977	7,414	-2,472	0,782	2144,893
2,0	-98,961	45,242	9,06	1,394	1,106	4298,394

3,0	-78,23	22,749	12,401	-9,353	2,288	9416,835
4,0	-71,549	16,286	13,633	-10,578	0,539	7867,776
5,0	-68,444	13,623	13,74	-11,444	0,228	7953,72
6,0	-68,302	13,504	12,437	2,063	0,01	7633,424
7,0	-65,254	13,715	0,794	6,316	0,245	3691,816
8,0	-64,593	15,573	0,715	3,247	0,833	331,43
9,0	-64,412	16,08	0,314	1,732	0,253	92,517
10,0	-64,358	16,233	0,216	0,889	0,174	22,159

Lancio n°56 Xp=-109,17 m yp=58,82 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-106,9	53,752	7,309	-2,43	0,756	2054,952
2,0	-98,908	45,232	8,95	1,425	1,093	4186,934
3,0	-78,511	23,004	12,312	-9,272	2,279	9283,441
4,0	-71,826	16,523	13,56	-10,508	0,543	7785,814
5,0	-68,716	13,856	13,671	-11,382	0,229	7872,763
6,0	-68,299	13,504	12,345	2,054	0,031	7632,369
7,0	-65,255	13,712	0,777	6,276	0,247	3638,119
8,0	-64,607	15,533	0,713	3,242	0,835	330,74
9,0	-64,427	16,039	0,314	1,729	0,253	92,044
10,0	-64,372	16,192	0,215	0,887	0,173	22,086

Lancio n°57 Xp=-108,83 m yp=58,33 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-106,641	53,529	7,199	-2,389	0,73	1964,285
2,0	-98,863	45,223	8,836	1,456	1,08	4074,539
3,0	-78,819	23,284	12,218	-9,187	2,269	9140,737
4,0	-72,13	16,784	13,483	-10,433	0,547	7699,873
5,0	-69,014	14,111	13,598	-11,317	0,231	7787,754
6,0	-68,3	13,504	12,247	2,044	0,052	7634,984
7,0	-65,257	13,709	0,758	6,23	0,249	3581,186
8,0	-64,623	15,489	0,711	3,238	0,836	330,071
9,0	-64,443	15,995	0,314	1,725	0,253	91,579
10,0	-64,389	16,146	0,214	0,885	0,172	22,019

Lancio n°58 Xp=-108,49 m yp=57,83 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-106,384	53,308	7,082	-2,349	0,702	1872,805
2,0	-98,827	45,216	8,716	1,488	1,067	3961,117
3,0	-79,158	23,591	12,118	-9,096	2,257	8987,765
4,0	-72,464	17,071	13,402	-10,353	0,552	7609,433
5,0	-69,341	14,392	13,521	-11,247	0,233	7698,177
6,0	-68,373	13,562	13,403	-11,389	0,072	7622,265
7,0	-68,305	13,503	12,185	2,053	0,005	7366,818
8,0	-65,256	13,71	0,748	6,206	0,25	3545,309
9,0	-64,63	15,468	0,71	3,237	0,837	329,887
10,0	-64,45	15,974	0,314	1,724	0,254	91,375
11,0	-64,396	16,125	0,213	0,884	0,172	21,992

Lancio n°59 Xp=-108,11 m yp=57,23 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-106,118	53,079	6,91	-2,298	0,663	1747,065
2,0	-98,84	45,219	8,545	1,53	1,053	3824,184

3,0	-79,73	24,112	11,969	-8,96	2,236	8748,304
4,0	-73,023	17,551	13,282	-10,236	0,56	7479,329
5,0	-69,886	14,859	13,408	-11,146	0,236	7568,787
6,0	-68,913	14,025	13,294	-11,294	0,073	7497,813
7,0	-68,615	13,769	13,099	-11,203	0,022	7312,553
8,0	-68,524	13,691	12,88	-11,038	0,007	7081,883

Lancio n°60 Xp=-107,81 m yp=56,71 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-105,937	52,924	6,732	-2,252	0,624	1625,684
2,0	-98,912	45,233	8,374	1,569	1,044	3707,946
3,0	-80,391	24,712	11,811	-8,816	2,212	8486,98
4,0	-74,102	18,627	11,209	-12,379	0,532	7171,023
5,0	-73,572	18,03	11,093	-12,408	0,047	6821,805

Lancio n°61 Xp=-107,51 m yp=56,19 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-105,763	52,774	6,536	-2,21	0,583	1502,203
2,0	-99,008	45,252	8,188	1,61	1,033	3588,998
3,0	-81,129	25,382	11,636	-8,657	2,183	8200,009
4,0	-76,588	21,257	11,993	-10,316	0,39	6355,349
5,0	-72,261	16,897	13,349	-10,435	0,361	7393,666
6,0	-69,495	14,524	13,436	-11,213	0,207	7604,683
7,0	-68,638	13,788	13,307	-11,319	0,064	7517,876
8,0	-68,375	13,563	13,107	-11,214	0,02	7323,535
9,0	-68,305	13,503	11,967	2,047	0,005	7086,389
10,0	-65,257	13,706	0,708	6,109	0,255	3420,269
11,0	-64,662	15,377	0,706	3,232	0,84	329,274
12,0	-64,483	15,882	0,315	1,719	0,255	90,724
13,0	-64,429	16,033	0,211	0,882	0,17	21,908

Lancio n°62 Xp=-107,4 m yp=56,16 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-105,624	52,654	6,589	-2,22	0,594	1534,807
2,0	-98,869	45,224	8,229	1,606	1,025	3575,001
3,0	-80,788	25,072	11,69	-8,705	2,197	8309,575
4,0	-76,226	20,929	12,044	-10,362	0,39	6410,883
5,0	-71,946	16,627	13,381	-10,474	0,355	7426,349
6,0	-69,206	14,276	13,463	-11,24	0,205	7636,438
7,0	-68,358	13,548	13,333	-11,342	0,063	7547,407
8,0	-68,305	13,503	12,137	2,052	0,004	7292,001
9,0	-65,256	13,709	0,739	6,184	0,251	3517,244
10,0	-64,637	15,448	0,709	3,236	0,838	329,702
11,0	-64,457	15,954	0,314	1,722	0,254	91,207
12,0	-64,403	16,105	0,213	0,884	0,171	21,969

Lancio n°63 Xp=-106,95 m yp=55,77 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-105,169	52,263	6,589	-2,22	0,594	1534,807
2,0	-104,488	51,982	6,548	-2,162	0,103	1195,68
3,0	-97,943	44,92	7,639	-7,871	1,0	3478,498
4,0	-97,119	44,013	10,369	-3,693	0,108	3147,102
5,0	-79,812	24,186	13,087	-9,996	1,669	9443,456

6,0	-72,599	17,187	14,357	-11,16	0,551	8757,16
7,0	-69,217	14,286	14,457	-12,047	0,236	8813,756
8,0	-68,302	13,504	12,808	2,045	0,063	8670,326
9,0	-65,255	13,712	0,857	6,464	0,238	3914,264
10,0	-64,546	15,704	0,725	3,265	0,827	334,571
11,0	-64,364	16,214	0,313	1,749	0,251	94,669
12,0	-64,269	16,293	0,93	0,409	0,304	48,323
13,0	-64,198	16,295	0,905	0,146	0,077	22,76

Lancio n°64 Xp=-106,49 m yp=55,38 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-104,793	52,102	5,777	1,014	0,567	1458,068
2,0	-96,614	43,708	9,477	-2,034	1,416	3547,266
3,0	-79,387	23,8	12,412	-9,369	1,818	8789,386
4,0	-72,533	17,13	13,692	-10,598	0,552	7949,914
5,0	-69,33	14,382	13,805	-11,49	0,234	8029,543
6,0	-68,338	13,531	13,683	-11,629	0,072	7945,209

Lancio n°65 Xp=-106,04 m yp=54,99 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-104,426	51,957	5,698	1,007	0,538	1376,315
2,0	-96,361	43,554	9,428	-2,002	1,416	3529,44
3,0	-79,176	23,608	12,385	-9,345	1,823	8776,83
4,0	-72,365	16,986	13,658	-10,574	0,55	7907,633
5,0	-69,185	14,258	13,771	-11,463	0,233	7989,257
6,0	-68,303	13,504	12,342	2,04	0,064	7875,242
7,0	-65,257	13,708	0,775	6,269	0,247	3636,58
8,0	-64,61	15,524	0,712	3,241	0,834	330,479
9,0	-64,43	16,03	0,314	1,728	0,253	91,938
10,0	-64,376	16,182	0,214	0,886	0,172	22,072

Lancio n°66 Xp=-105,59 m yp=54,6 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-104,062	51,813	5,612	0,994	0,508	1294,079
2,0	-96,127	43,412	9,373	-1,967	1,414	3506,804
3,0	-79,005	23,452	12,353	-9,314	1,827	8753,649
4,0	-72,234	16,874	13,62	-10,546	0,548	7860,939
5,0	-69,075	14,163	13,733	-11,431	0,232	7944,461
6,0	-68,301	13,504	12,333	2,043	0,056	7801,541
7,0	-65,256	13,709	0,773	6,266	0,247	3630,82
8,0	-64,611	15,522	0,712	3,241	0,835	330,491
9,0	-64,431	16,028	0,314	1,728	0,253	91,925
10,0	-64,377	16,18	0,214	0,886	0,172	22,072

Lancio n°67 Xp=-105,13 m yp=54,21 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-103,088	49,893	4,454	-6,477	0,681	1802,668
2,0	-102,931	49,659	5,639	-5,424	0,035	1537,579
3,0	-101,627	48,142	6,094	-6,299	0,231	1955,148
4,0	-100,647	47,002	6,359	-6,846	0,161	2201,966
5,0	-99,933	46,172	6,494	-7,168	0,112	2348,843
6,0	-99,424	45,58	6,537	-7,334	0,078	2418,458
7,0	-99,165	45,282	8,574	1,374	0,04	2391,513

8,0	-80,349	24,674	11,937	-8,93	2,195	8589,272
9,0	-73,665	18,135	11,428	-12,551	0,56	7440,779
10,0	-73,526	17,982	13,0	-10,311	0,012	6893,31
11,0	-71,297	16,07	13,044	-10,931	0,171	7172,521
12,0	-70,608	15,478	12,905	-10,99	0,053	7075,536
13,0	-70,396	15,297	12,706	-10,875	0,016	6884,163
14,0	-70,332	15,242	12,49	-10,707	0,005	6661,244

Lancio n°68 Xp=-104,68 m yp=53,82 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-102,543	49,208	6,701	-4,055	0,711	1900,581
2,0	-98,638	45,179	8,341	1,614	0,583	2757,762
3,0	-80,042	24,395	11,818	-8,823	2,23	8563,275
4,0	-73,363	17,842	13,151	-10,115	0,565	7333,684
5,0	-70,235	15,158	13,282	-11,036	0,238	7425,386
6,0	-69,264	14,326	13,172	-11,188	0,073	7359,016
7,0	-68,966	14,07	12,979	-11,099	0,023	7178,466
8,0	-68,875	13,992	12,762	-10,937	0,007	6952,417

Lancio n°69 Xp=-104,22 m yp=53,43 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-102,026	48,606	6,805	-4,101	0,732	1970,782
2,0	-98,489	45,15	8,369	1,577	0,52	2607,584
3,0	-79,777	24,154	11,856	-8,857	2,236	8643,271
4,0	-73,118	17,632	13,176	-10,143	0,562	7358,943
5,0	-70,002	14,959	13,305	-11,057	0,237	7451,274
6,0	-69,036	14,13	13,193	-11,207	0,073	7383,553
7,0	-68,739	13,875	13,0	-11,117	0,022	7201,839
8,0	-68,648	13,798	12,782	-10,955	0,007	6974,875

Lancio n°70 Xp=-104,1 m yp=53,44 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-101,838	48,387	6,916	-4,152	0,754	2048,729
2,0	-98,419	45,136	8,448	1,546	0,494	2583,818
3,0	-79,438	23,846	11,931	-8,926	2,247	8771,232
4,0	-72,793	17,353	13,234	-10,202	0,557	7420,457
5,0	-69,687	14,689	13,359	-11,106	0,235	7512,797
6,0	-68,724	13,863	13,245	-11,253	0,072	7442,58
7,0	-68,428	13,609	13,05	-11,161	0,022	7258,562
8,0	-68,338	13,531	12,832	-10,998	0,007	7029,584

Lancio n°71 Xp=-103,54 m yp=53,22 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-101,102	47,531	7,198	-4,291	0,814	2260,047
2,0	-98,295	45,112	8,595	1,411	0,39	2424,942
3,0	-78,926	23,381	12,059	-9,043	2,254	8972,117
4,0	-72,297	16,927	13,336	-10,303	0,55	7530,762
5,0	-69,205	14,275	13,455	-11,193	0,232	7622,537
6,0	-68,304	13,503	12,117	2,036	0,067	7531,33
7,0	-65,258	13,705	0,734	6,171	0,251	3505,767
8,0	-64,643	15,432	0,708	3,234	0,838	329,457
9,0	-64,463	15,937	0,314	1,721	0,254	91,076
10,0	-64,409	16,088	0,212	0,883	0,171	21,949

Lancio n°72 Xp=-102,46 m yp=51,99 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-100,001	46,251	7,218	-4,302	0,818	2276,421
2,0	-98,511	45,154	8,33	1,062	0,206	1993,718
3,0	-80,696	24,989	11,754	-8,764	2,139	8339,186
4,0	-76,11	20,823	12,107	-10,419	0,39	6478,488
5,0	-71,832	16,529	13,435	-10,525	0,353	7487,298
6,0	-69,092	14,178	13,515	-11,286	0,204	7696,624
7,0	-68,304	13,503	12,173	2,039	0,058	7587,711
8,0	-65,257	13,706	0,744	6,196	0,25	3538,099
9,0	-64,634	15,456	0,709	3,236	0,837	329,67
10,0	-64,454	15,961	0,314	1,723	0,254	91,27
11,0	-64,401	16,112	0,213	0,884	0,171	21,973

Lancio n°73 Xp=-102,19 m yp=51,45 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-99,825	46,047	7,075	-4,229	0,788	2165,505
2,0	-98,607	45,173	8,12	0,978	0,172	1858,313
3,0	-81,669	25,873	11,542	-8,572	2,086	7969,783
4,0	-77,166	21,782	11,902	-10,233	0,39	6257,186
5,0	-72,77	17,333	13,29	-10,365	0,369	7330,92
6,0	-69,964	14,927	13,382	-11,161	0,211	7543,146
7,0	-69,095	14,181	13,257	-11,274	0,065	7460,081
8,0	-68,828	13,952	13,058	-11,171	0,02	7268,655
9,0	-68,747	13,882	12,838	-11,004	0,006	7036,853

Lancio n°74 Xp=-101,92 m yp=50,91 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-99,654	45,848	6,922	-4,155	0,756	2053,048
2,0	-98,716	45,194	7,894	0,873	0,136	1721,683
3,0	-82,723	26,83	11,309	-8,361	2,026	7572,554
4,0	-78,314	22,825	11,676	-10,028	0,39	6017,487
5,0	-76,936	21,573	11,668	-10,42	0,118	6041,902
6,0	-76,51	21,186	11,526	-10,415	0,037	5940,817
7,0	-76,379	21,067	11,342	-10,287	0,011	5770,524

Lancio n°75 Xp=-101,85 m yp=50,7 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-99,635	45,826	6,829	-4,112	0,737	1987,664
2,0	-98,734	45,198	7,793	0,869	0,132	1676,019
3,0	-83,084	27,158	11,213	-8,275	2,008	7427,295
4,0	-78,713	23,188	11,584	-9,944	0,39	5920,543
5,0	-77,347	21,946	11,577	-10,338	0,118	5947,482
6,0	-76,924	21,562	11,436	-10,334	0,036	5848,889
7,0	-76,795	21,445	11,254	-10,207	0,011	5681,61

Lancio n°76 Xp=-101,45 m yp=50,24 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-99,244	45,371	6,829	-4,112	0,737	1987,663
2,0	-99,072	45,264	7,573	0,434	0,025	1502,633

3,0	-84,867	28,82	10,368	-9,987	1,876	6815,874
4,0	-84,336	28,296	10,784	-9,467	0,051	5084,963
5,0	-83,612	27,638	10,709	-9,627	0,067	5109,075
6,0	-83,389	27,436	10,557	-9,559	0,021	4992,372
7,0	-83,321	27,374	10,382	-9,422	0,006	4837,754

Lancio n°77 Xp=-101,06 m yp=49,79 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-98,95	45,24	4,737	2,333	0,704	1879,796
2,0	-91,321	36,276	7,685	-7,012	1,611	3576,562
3,0	-88,396	32,897	8,143	-8,838	0,381	3684,768
4,0	-87,453	31,807	8,196	-9,292	0,116	3791,917
5,0	-87,159	31,467	8,114	-9,318	0,036	3758,656
6,0	-87,068	31,363	7,99	-9,213	0,011	3660,467

Lancio n°78 Xp=-100,67 m yp=49,33 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-98,683	45,188	4,685	2,34	0,663	1745,722
2,0	-91,038	35,949	7,738	-7,043	1,632	3657,231
3,0	-88,047	32,493	8,202	-8,898	0,387	3740,206
4,0	-87,082	31,379	8,257	-9,359	0,118	3848,476
5,0	-86,781	31,031	8,175	-9,388	0,036	3815,236
6,0	-86,689	30,924	8,05	-9,282	0,011	3715,845

Lancio n°79 Xp=-100,28 m yp=48,88 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-98,422	45,137	4,63	2,34	0,619	1611,259
2,0	-90,788	35,66	7,778	-7,064	1,649	3724,585
3,0	-87,742	32,141	8,248	-8,943	0,392	3782,906
4,0	-86,759	31,005	8,304	-9,411	0,119	3892,139
5,0	-86,452	30,651	8,222	-9,441	0,037	3858,992
6,0	-86,358	30,543	8,097	-9,336	0,011	3758,616

Lancio n°80 Xp=-99,89 m yp=48,42 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-98,168	45,087	4,569	2,331	0,574	1476,348
2,0	-90,575	35,414	7,804	-7,073	1,662	3776,743
3,0	-87,484	31,844	8,279	-8,973	0,396	3811,972
4,0	-86,487	30,692	8,336	-9,447	0,12	3922,093
5,0	-86,177	30,333	8,254	-9,478	0,037	3889,177
6,0	-86,082	30,223	8,128	-9,372	0,012	3788,205

Lancio n°81 Xp=-99,5 m yp=47,97 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-97,822	44,76	5,517	-4,381	0,559	1433,858
2,0	-96,88	43,868	7,083	-2,507	0,171	1454,691
3,0	-87,42	31,769	9,442	-9,112	1,336	5352,063
4,0	-84,402	28,356	11,017	-8,963	0,32	5216,208
5,0	-82,054	26,223	11,164	-9,82	0,213	5496,535
6,0	-81,322	25,558	11,08	-9,966	0,066	5471,416
7,0	-81,097	25,353	10,92	-9,89	0,02	5342,734

8,0	-81,028	25,29	10,739	-9,746	0,006	5176,086

Lancio n°82 Xp=-99,11 m yp=47,51 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-97,391	44,19	5,593	-4,412	0,572	1472,093
2,0	-97,328	44,14	6,232	-2,992	0,011	1200,046
3,0	-96,332	43,536	6,456	-3,367	0,16	1332,814
4,0	-95,613	43,101	6,56	-3,594	0,111	1402,564
5,0	-95,104	42,792	6,581	-3,722	0,078	1430,958
6,0	-87,427	31,778	9,185	-8,797	1,166	5023,389
7,0	-84,422	28,373	10,751	-8,722	0,327	4965,18
8,0	-82,134	26,295	10,903	-9,584	0,213	5239,709
9,0	-81,419	25,646	10,824	-9,733	0,066	5220,376
10,0	-81,2	25,446	10,669	-9,661	0,02	5099,06
11,0	-81,132	25,385	10,492	-9,521	0,006	4940,416

Lancio n°83 Xp=-98,72 m yp=47,06 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-97,092	43,997	6,304	-0,501	0,541	1384,855
2,0	-87,488	31,847	8,973	-8,479	1,524	4939,171
3,0	-84,412	28,365	10,532	-8,518	0,343	4768,405
4,0	-82,157	26,316	10,692	-9,39	0,214	5035,671
5,0	-81,452	25,676	10,617	-9,545	0,066	5021,632
6,0	-81,236	25,479	10,466	-9,476	0,02	4906,428
7,0	-81,169	25,419	10,292	-9,34	0,006	4754,287

Lancio n°84 Xp=-98,32 m yp=46,6 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-96,805	43,823	6,165	-0,502	0,507	1291,466
2,0	-87,475	31,833	8,886	-8,372	1,513	4847,639
3,0	-84,414	28,366	10,439	-8,436	0,345	4683,479
4,0	-82,184	26,34	10,6	-9,307	0,214	4948,583
5,0	-81,487	25,707	10,527	-9,463	0,066	4936,233
6,0	-81,272	25,513	10,377	-9,396	0,02	4823,449
7,0	-81,207	25,453	10,205	-9,261	0,006	4673,992

Lancio n°85 Xp=-98,73 m yp=46,73 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)

Lancio n°86 Xp=-98,14 m yp=46,61 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-96,568	43,68	6,242	-0,5	0,526	1342,165
2,0	-86,923	31,195	9,023	-8,506	1,545	5033,128
3,0	-84,175	28,149	10,419	-8,511	0,305	4655,069
4,0	-82,148	26,308	10,552	-9,292	0,195	4908,093
5,0	-81,515	25,733	10,47	-9,42	0,06	4886,275
6,0	-81,321	25,556	10,318	-9,345	0,019	4770,053
7,0	-81,261	25,502	10,146	-9,209	0,006	4620,716

Lancio n°87 Xp=-96,73 m yp=45,8 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-95,129	42,808	6,272	-0,501	0,533	1362,549
2,0	-84,843	28,792	9,346	-8,795	1,64	5551,173
3,0	-84,281	28,246	9,654	-8,494	0,06	4081,929
4,0	-83,739	27,753	9,581	-8,619	0,056	4090,783
5,0	-83,572	27,601	9,443	-8,552	0,017	3995,038
6,0	-83,521	27,555	9,286	-8,428	0,005	3870,426

Lancio n°88 Xp=-96,37 m yp=45,32 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-94,887	42,652	5,021	-4,385	0,493	1255,191

Lancio n°89 Xp=-96,35 m yp=45,3 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-94,87	42,628	5,023	-4,386	0,493	1256,196
2,0	-90,665	35,518	7,728	-7,224	0,837	3408,321
3,0	-87,981	32,417	8,138	-8,88	0,347	3681,67
4,0	-87,117	31,42	8,175	-9,282	0,106	3777,068
5,0	-86,849	31,11	8,088	-9,293	0,033	3736,719
6,0	-86,767	31,014	7,963	-9,183	0,01	3636,496

Lancio n°90 Xp=-95,84 m yp=44,99 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-93,792	40,668	3,848	-6,869	0,681	1805,043
2,0	-92,859	38,713	4,664	-7,796	0,243	2118,982
3,0	-91,944	36,996	7,0	-6,861	0,196	2529,694
4,0	-90,196	34,976	7,289	-8,043	0,25	2949,774
5,0	-89,636	34,329	7,293	-8,308	0,077	3012,993
6,0	-89,462	34,129	7,206	-8,288	0,024	2969,286
7,0	-89,41	34,068	7,092	-8,181	0,007	2885,202

Lancio n°91 Xp=-95,32 m yp=44,68 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-92,753	38,508	5,506	-7,044	0,857	2420,417
2,0	-91,208	36,145	7,113	-7,212	0,281	2666,306
3,0	-89,751	34,462	7,329	-8,156	0,205	2994,157
4,0	-89,288	33,927	7,309	-8,348	0,063	3033,469
5,0	-89,145	33,762	7,215	-8,305	0,02	2978,871

Lancio n°92 Xp=-94,81 m yp=44,37 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-91,934	36,984	6,707	-5,783	0,959	2824,229
2,0	-89,246	33,879	7,232	-7,757	0,401	2885,013
3,0	-88,365	32,861	7,313	-8,263	0,122	3009,019
4,0	-88,09	32,543	7,25	-8,317	0,038	2997,339
5,0	-88,005	32,445	7,142	-8,233	0,012	2923,727

Lancio n°93 Xp=-94,3 m yp=44,06 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)

1,0	-91,328	36,284	6,815	-5,88	0,99	2953,774
2,0	-88,56	33,086	7,343	-7,878	0,406	2977,141
3,0	-87,654	32,039	7,424	-8,389	0,123	3101,974
4,0	-87,37	31,712	7,36	-8,444	0,038	3089,426
5,0	-87,283	31,611	7,251	-8,358	0,012	3013,533

Lancio n°94 Xp=-93,46 m yp=43,24 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-90,438	35,256	6,87	-5,931	1,006	3022,402
2,0	-87,629	32,011	7,4	-7,939	0,409	3024,811
3,0	-86,71	30,95	7,481	-8,454	0,124	3149,981
4,0	-86,423	30,618	7,416	-8,509	0,038	3136,928
5,0	-86,335	30,516	7,306	-8,422	0,012	3059,767

Lancio n°95 Xp=-92,94 m yp=42,46 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-89,979	34,725	6,806	-5,871	0,987	2942,24
2,0	-87,218	31,536	7,334	-7,867	0,406	2969,046
3,0	-86,314	30,491	7,414	-8,378	0,123	3093,816
4,0	-86,031	30,164	7,35	-8,433	0,038	3081,349
5,0	-85,944	30,064	7,241	-8,347	0,012	3005,639

Lancio n°96 Xp=-92,7 m yp=41,91 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-89,829	34,552	6,701	-5,777	0,957	2816,901
2,0	-87,146	31,452	7,226	-7,75	0,4	2879,715
3,0	-86,266	30,436	7,306	-8,255	0,122	3003,674
4,0	-85,991	30,119	7,243	-8,31	0,038	2992,025
5,0	-85,906	30,021	7,136	-8,226	0,012	2918,637

Lancio n°97 Xp=-92,46 m yp=41,36 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-89,682	34,382	6,591	-5,68	0,926	2690,379
2,0	-87,082	31,379	7,111	-7,627	0,394	2786,76
3,0	-86,229	30,394	7,191	-8,125	0,12	2909,616
4,0	-85,962	30,085	7,129	-8,179	0,037	2898,769
5,0	-85,88	29,99	7,024	-8,096	0,012	2827,743

Lancio n°98 Xp=-92,22 m yp=40,81 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-89,539	34,217	6,476	-5,579	0,894	2562,546
2,0	-87,028	31,317	6,99	-7,496	0,388	2689,84
3,0	-86,204	30,364	7,069	-7,987	0,118	2811,243
4,0	-85,946	30,066	7,008	-8,04	0,037	2801,11
5,0	-85,866	29,974	6,905	-7,959	0,011	2732,475

Lancio n°99 Xp=-92,02 m yp=40,35 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)

1,0	-89,42	34,08	6,374	-5,492	0,866	2454,711
2,0	-86,99	31,272	6,883	-7,381	0,381	2605,603
3,0	-86,19	30,349	6,961	-7,865	0,116	2725,498
4,0	-85,94	30,06	6,901	-7,917	0,036	2715,915
5,0	-85,863	29,971	6,799	-7,837	0,011	2649,419

Lancio n°100 Xp=-91,74 m yp=39,82 m

Ni	xi(m)	yi(m)	vx(m/s)	vy(m/s)	t(s)	E(KJ)
1,0	-89,227	33,857	6,272	-5,408	0,838	2351,533
2,0	-86,877	31,142	6,775	-7,267	0,375	2522,771
3,0	-86,103	30,248	6,852	-7,742	0,114	2640,944
4,0	-85,861	29,968	6,793	-7,794	0,035	2631,841
5,0	-85,786	29,882	6,693	-7,715	0,011	2567,436

ELABORAZIONI STATISTICHE

Velocità massima	31,782	m/s
Velocità minima	0,315	m/s
Velocità media	12,677	m/s
Scarto quadratico medio	7,572	m/s
Energia massima pre-impatto	**18945,76**	**KJ**
Energia media pre-impatto	4507,175	KJ
Scarto quadratico energia	4107,679	KJ
Ascissa media di arresto	-71,38	m
Ascissa massima raggiunta	0,0	m

% Massi fermati

X (m)	% Massi fermati
-126,96	0
-105,96	3,076923
-84,96	20
-63,96	81
-42,96	100
-21,96	100

Le verifiche eseguite sulla funzionalità del terrapieno/vallo, in relazione agli scenari conseguenti alla presenza nel versante di un antico accumulo di frana costituito da massi calcarei mutuamente incastrati tra loro e disposti con pendenze intorno al 100%, hanno dato conferma dell'efficacia dell'opera a difesa e contenimento del piazzale delle lavorazioni in un ottica di mitigazione del rischio geomorfologico proprio della zona del piazzale.

Borgio Verezzi Maggio 2014

Il tecnico

integrazioni impatto acustico

Legge n° 447/1995 – Legge Regionale n° 12 20/03/1998
D.G.R. n° 534 28/05/1999

Il tecnico competente

DIONIGI PEDRETTI
TECNICO COMPETENTE IN ACUSTICA AMBIENTALE
DECRETO REGIONE LOMBARDIA
N. 2125 DEL 4 MARZO 2008

La presente relazione è redatta per approfondire alcuni aspetti così come richiesto dalla Regione Liguria ufficio VIA, relativamente all'istruttoria di verifica screening connessa al rinnovo dell'autorizzazione provinciale per l'impianto di recupero di rifiuti inerti esistente sito in Finale Ligure (SV) loc. Sanguineo.

1) Il numero di veicoli pesanti che hanno avuto accesso all'impianto nel giorno 08 maggio 2014 nell'orario di apertura del centro di recupero (dati forniti dalla ditta), come risulta dai formulari di identificazione dei rifiuti, transitanti lungo la strada provinciale SP 27, sono stati n. 18 veicoli pesanti e n. 57 veicoli leggeri per un totale di n. 75 veicoli.

   Dall'analisi degli eventi ricavati dalla misura di rumore, della durata di 10 ore comprendente l'orario di apertura dell'impianto, descritta al successivo punto 4) è emerso che il numero totale di veicoli transitanti lungo la strada provinciale SP 27 corrisponde a n. 73 veicoli pesanti e n. 377 veicoli leggeri per un totale di n. 450 veicoli (comprensivi dei veicoli in entrata all'impianto).

   Dai dati sopra descritti si ricava che l'incidenza del traffico veicolare indotta dall'impianto della Delprino Snc è pari al 17% rispetto al traffico totale transitante lungo la provinciale SP 27, l'incidenza del traffico pesante è pari al 25% rispetto al traffico pesante totale e al 4% rispetto al traffico totale.

   Tali valori dal punto di vista acustico hanno un effetto trascurabile rispetto al rumore generato dal traffico veicolare globale medio che percorre la strada provinciale SP 27.

2) Per quanto riguarda il livello di emissione sonora dell'impianto, lo stesso si ricava dai risultati delle misure riportate nella relazione di valutazione di impatto acustico n. R-09-004 del 17/01/2009 e precisamente dalla tabella "*Scheda di rilevamento inquinamento acustico tipo 4 Caratterizzazione acustica del territorio"*

Posizione	T_R	T_O	T_M	L_{Amax}	L_{01}	L_{10}	L_{50}	L_{90}	L_{95}	L_{99}	L_{Amin}
1A	d	10:30	15'	84.5	75.6	64.1	52.5	48.4	47.4	46.4	45.5
2R	d	11:12	10'	84.3	75.4	61.9	48.8	46.1	45.6	44.9	43.6

Posizione	T_R	L_{Aeq}	L_{Aealim}
1A	d	63.2	55
1R	d	61.7	55

L'emissione prodotta dall'impianto è ricavabile facendo la differenza tra il rumore ambientale ed il

rumore residuo, utilizzando i valori statistici dell'emissione sonora, in particolare il 95° percentile (LN 95) che indica il valore superato durante il 95% del periodo delle misure.

In questo modo viene evidenziato il contributo dell'emissione sonora continua prodotta dall'impianto, rispetto al rumore residuo presente nell'area quando non interviene il transito di veicoli.

I due valori sono rispettivamente:

LN95 ambientale = 47,4 dB(A)

LN95 residuo = 45,6 dB(A)

L'emissione dell'impianto è data dalla differenza fra i due valori,

47,4 – 45,6 = **42,7** dB(A)

che risulta essere compatibile con il limite di emissione (in periodo diurno) della classe II (50 dB), dove sono ubicate le abitazioni.

3) Premesso che dall'analisi dei risultati fonometrici, vengono rispettati tutti i limiti di legge (immissione, emissione e differenziale), l'azienda si era già adoperata al fine di ridurre i possibili impatti di varia natura, sia visivi, sia per le polveri che per il rumore, piantumando piante sempreverdi sul perimetro del piazzale dell'impianto, lato strada provinciale e lato valle, come risulta dalla foto 1 sotto riportata.



foto 1 presa dalla strada provinciale SP 27

4) Al fine di caratterizzare il rumore del traffico veicolare lungo la strada Provinciale n. 27, è stata eseguita in data 08 maggio 2014 una misura nel periodo diurno di apertura dell'impianto 08.00 – 18.00, a bordo strada (circa 4 metri dalla carreggiata) a 4 metri di altezza foto 2 e 3, nel rispetto di quanto previsto dal DECRETO MINISTERIALE 16 marzo 1998 - Tecniche di rilevamento e di misurazione dell'inquinamento acustico (G.U. 1° aprile 1998, n. 76).

Tale misura ha lo scopo di verificare il rispetto dei limiti del rumore indotto dal traffico veicolare rispetto a quanto fissato dal DPR n.142 del 30/03/2004 (Disposizioni per il contenimento e la prevenzione dell'inquinamento acustico derivante dal traffico veicolare ..).

Per quanto riguarda l'emissione sonora derivante dall'infrastruttura stradale SP 27, assimilata ad una "strada extraurbana secondaria a carreggiata unica" – sottotipo C b, si applicano i limiti della Tab. 2 – All. 1 del DPR 30/03/2004 n.142.

Tab. 2 – strade esistenti e assimilabili

TIPO DI STRADA	Ampiezza fascia di pertinenza acustica (m)	Scuole, ospedali, case di cura e di riposo		Altri Ricettori	
		Diurno dB(A)	Notturno dB(A)	Diurno dB(A)	Notturno dB(A)
C b	100 (fascia A)	50	40	70	60
	50 (fascia B)			65	55

Di seguito in figura 1 e 2, si riportano, il grafico della misurazione effettuata relativo all' andamento temporale del rumore time history e diviso per fasce orarie.

Sono stati inoltre estrapolati il numero totali degli eventi corrispondenti al numero di passaggio di veicoli. Da tale analisi nel periodo di osservazione 08.00:18.00 risulta che il numero di veicoli pesanti transitanti lungo la strada provinciale SP 27 corrisponde a n. 73 mentre il numero di veicoli leggeri transitanti lungo la strada provinciale SP 27 corrisponde a n. 377.

Per il riconoscimento degli eventi si sono assunti i seguenti criteri:

livello di soglia 75 dB, durata min evento 1 s, durata max evento 5 s, per i veicoli pesanti;

livello di soglia 70 dB, durata min evento 1 s, durata max evento 5 s, per i veicoli leggeri.

In figura 3 è riportato un estratto del grafico della time history riportante l'individuazione degli eventi.

Come risulta dagli elaborati grafici, il rumore del traffico veicolare dovuto ai transiti lungo la strada è provinciale SP 27, è compatibile con i limiti fissati dal DPR n.142 del 30/03/2004, nel periodo di osservazione diurno.

Risultati misura

Leq	L_{Amax}	L_{01}	L_{10}	L_{50}	L_{90}	L_{95}	L_{99}	L_{Amin}
61.7	88.6	73.3	64.8	51.9	46.6	45.7	44.7	43.1

Fig. 1 - grafico andamento temporale rumore time history

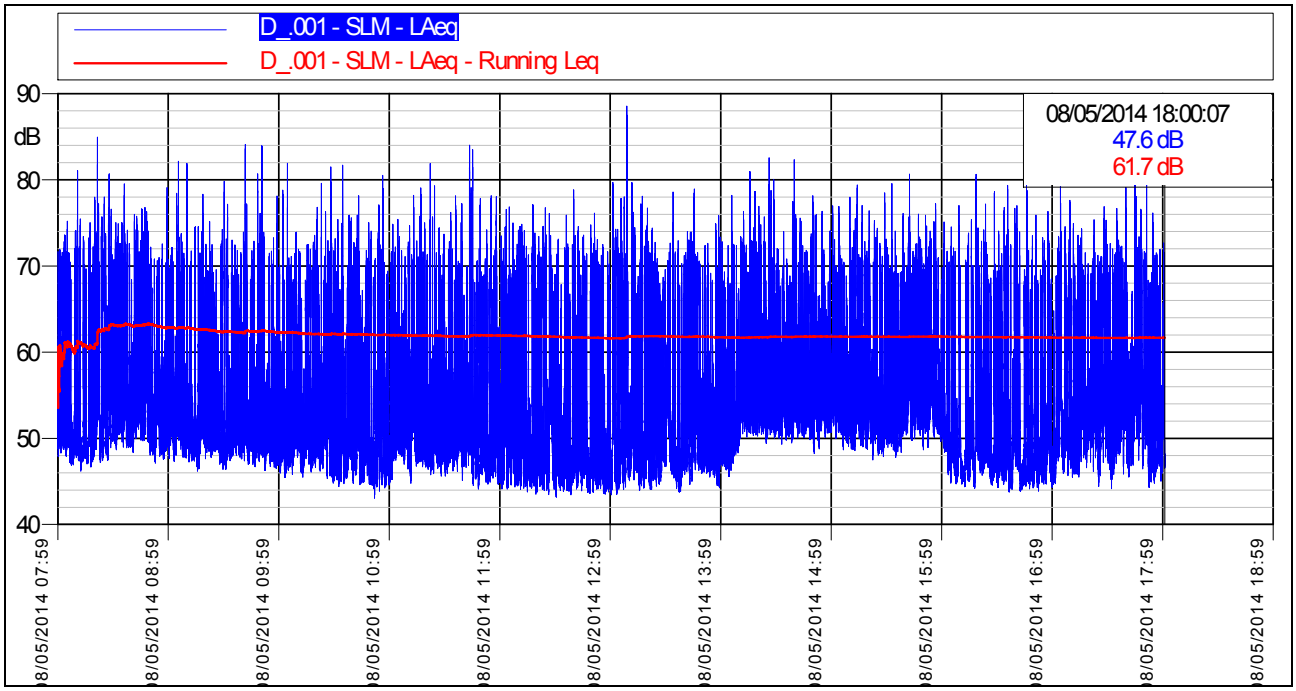


Fig. 2 - grafico fasce orarie

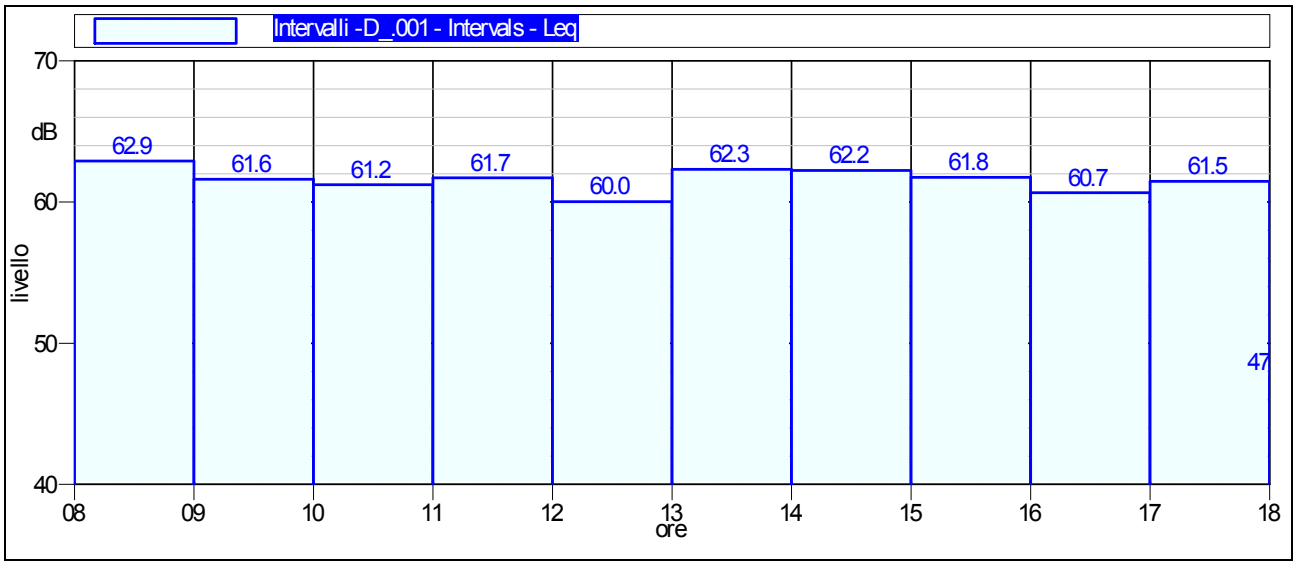


Fig. 3 - grafico estratto time history con eventi

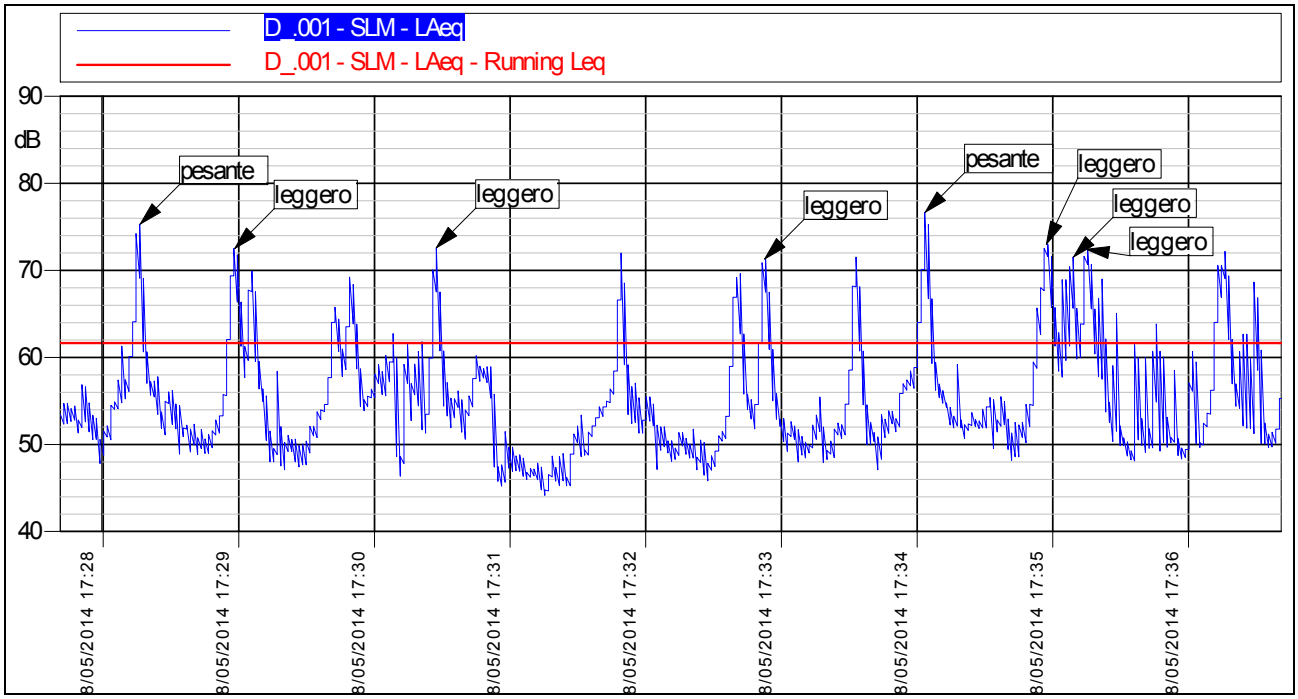




foto 1



foto 2

vista aerea con postazione misura e punto presa foto 1





SIT SERVIZIO DI TARATURA IN ITALIA
Calibration Service in Italy

CENTRO DI TARATURA 068
Calibration Centre

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ESTRATTO DEL CERTIFICATO DI TARATURA N. 22178-A

Data Certificato 2008-01-14
Destinatario POLITECNA SAS DI PEDRETTI & C.

Parametri ambientali

	Di riferimento	Durante la misura
Temperatura (°C)	23.0	19.5
Umidità (%)	50.0	42.9
Pressione (hPa)	1013.3	1007.4

Catena di misura analizzata

Strumento	Modello	Costruttore	Matricola
Fonometro	824	Larson & Davis	159
Preamplificatore	PRM 902	Larson & Davis	498
Microfono	2541	Larson & Davis	7669

Il Responsabile del Centro
Sergio Mario

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ESTRATTO DEL CERTIFICATO DI TARATURA N. 22179-A

Data Certificato 2008-01-14
Destinatario POLITECNA SAS DI PEDRETTI & C.

Parametri ambientali

	Di riferimento	Durante la misura
Temperatura (°C)	23.0	19.5
Umidità (%)	50.0	42.9
Pressione (hPa)	1013.3	1007.4

Catena di misura analizzata

Strumento	Modello	Costruttore	Matricola
Calibratore	CAL200	Larson & Davis	4869

Il Responsabile del Centro
Sergio Mario