子弹的速度：

已提供：1000 m/s，超过声速，因此会产生马赫波。

子弹的特性：

口径（直径）：常见狙击枪口径如 .308 Winchester

质量：10g(8.1～12.0克)

声速：340.2 m/s

枪口效应：不考虑

环境和地形：

大气条件：

温度、压力、湿度：都按照常温大气压，湿度不考虑

无风状态

重力：9.8N/kg

空气阻力：5.8N

计算过程：

要计算超音速子弹的空气阻力，我们可以使用以下公式:



其中:

-  是阻力系数，对于超音速子弹，这个值通常在 0.1 到 0.3 之间，具体取决于子弹的形状和马赫数。我们可以假设一个中间值  。

-  是空气密度，标准条件下大约为  。

-  是子弹迎风面的面积，可以通过子弹的直径计算。对于 308 Winchester，其直径约为  英寸)，因此: 

-  是子弹的速度，  。

计算步骤

1. \*\*计算迎风面积 



2. \*\*使用标准大气压下的空气密度  \*\*。

3. \*\*代入公式计算阻力  :



因此，在这个例子中， 308 Winchester 子弹在 1000 米/秒的速度下通过标准大气条件的空气时，会遇到大约 5.8 牛顿的阻力。

这个计算提供了一个基本的估计，实际的阻力可能会因子弹的确切形状、空气条件的微小变化以及子弹表面的状态等因素而有所不同。此外，超音速飞行时的复杂流体动力学效应（如激波和压缩效应) 也可能影响实际的阻力系数。

finish

/clear

/filname, trans\_test,1

/prep7

et,1,141

mp, ex,1,1

mp, kxx,2,190

mp, dens,2,2700

mp, c,2,900

x0=0

x1=0.5

x21=0.515

x22=0.525

x23=0.57

x3=5

thick=0.0025

y0=0

y1=0.01

y2=y1+0.0025

y3=2.5

dt=0.000001

rect, x0, x1, y0, y3

rect, x23, x3, y0, y2

rect, x23, x3, y2, y2+thick

rect, x23, x3, y2+thick, y3

rect, x22, x23, y2, y2+thick

rect, x22, x23, y2+thick, y3

aglue, all

k,,x1+thick

k,,x21, y1

k,,x21, y1+thick

bsplin,2,13,20

bsplin,17,10,9

a,2,20,17,9

a,2,20,24,3

Isel, s, length,,0.0025

lesi, all,,,4,,,,,0

lsel, s, loc, x, x0+dt, x1-dt

lesi, all,,,70,5

Isel, s, loc, x, x1+dt, x22-dt

lesi, all,,,10,1

Isel, s, loc, x, x22+dt, x23-dt

lesi, all,,,15,-4

lsel, s, loc, x, x23+dt, x3-dt

lesi, all,,,125,15

Isel, s, loc, y, y2+dt, y3-dt

lesi, all,,,125,20

Isel, s, loc, x, x23

Isel, a, loc, x, x3

Isel, r, loc, y, y0+dt, y1-dt

lesi, all,,,8,-3

FLST,5,5,4,ORDE,5

FITEM,5,1

FITEM,5,4

FITEM,5,7

FITEM,5,11

FITEM,5,15

CM,\_Y1, LINE

LSEL,,,,P51X

\*GET,\_z1, LINE,,COUNT

\*SET,\_z2,0

\*D0,\_z5,1,\_z1

\*SET,\_z2, LSNEXT (\_z2)

\*GET,\_z3, LINE,\_z2, ATTR, NDNX

\*GET, z4, LINE,\_z2,ATTR, SPNX

\*get,\_z6, line,\_z2, attr, kynd

\*IF,\_z3, GT, 0, THEN

\*IF,\_z4, NE, 0, THEN

LESIZE,\_z2,,,Z3,1/\_z4,,,,\_z6

\*ENDIF

\*ENDIF

\*ENDDO

CMSEL, S, \_Y1

CMDELE, \_Y1

alls

MSHAPE,0,2D

MSHKEY,1

asel, s, loc, x, x1, x23

asel, r, loc, y, y0, y2+thick

mat,2

amesh, all

asel, inve

mat, 1

amesh, all

nsel, s, loc, y,0

d, all, vy,0

nsel, s, loc, x, x23

nsel, r, loc, y, y0, y2

d, all, vx,0

d, all, vy,0

nsel, s, loc, x, x0

d, all, vx,2\*20.05\*(293\*0.5)

d, all, vy,0

d, all, temp,1.16\*293

d, all, pres,0

nsel, s, loc, y, y3

d, all, vy

nsel, s, loc, x, x3

d, all, pres,0

lsel, s,,,8,10,2

Isel, a,,,29

dl, all,, temp,300,1

alls

tunif,293

/solu

FLDATA1, SOLU, TRAN,1

FLDATA1, SOLU, FLOW,1

FLDATA1, SOLU, TEMP,1

FLDATA1, SOLU, TURB,1

FLDATA1, SOLU, COMP,1

FLDATA1, SOLU, VOF,0

FLDATA1, SOLU, SFTS,0

FLDATA1, SOLU, IVSH, 0

FLDATA1, SOLU, SWRL, 0

FLDATA1, SOLU, SPEC, 0

FLDATA1, SOLU, ALE, 0

FLDATAI, SOLU, RDSF, 1

/COM,, Transient Analysis, 1

\*SET, z4,\_999

\*SET,\_z14,1

!\*

FLDATA4, TIME, STEP,0.00005,

FLDATA4, TIME, ISTEP, 0

FLDATA4, TIME, NUMB,999,

FLDATA4, TIME, TEND,1.0e06

FLDATA4, TIME, GLOB,8,

FLDATA4, TIME, VX,0.01,

FLDATA4, TIME, VY,0.01,

FLDATA4, TIME, VZ,0.01,

FLDATA4, TIME, PRES,1e-006,

FLDATA4, TIME, TEMP,1e-006,

FLDATA4, TIME, ENKE,0.01,

FLDATA4, TIME, ENDS,0.01,

FLDATA4A, STEP, OVER,10,

FLDATA4, TIME, OVER,0

FLDATA4A, STEP, APPE,10,

FLDATA4, TIME, APPE,1.0e6

FLDATA4A, STEP, SUMF,10,

FLDATA4, TIME, SUMF,1.0e6

FLDATA4, TIME, BC,0

FLDATA4, TIME, TEND,1000000,

/COM,,Transient Analysis,1

FLDATA12, PROP, DENS,4

FLDATA13, VARY, DENS,1

FLDATA12, PROP, VISC,4

FLDATA13, VARY, VISC, 0

FLDATA12, PROP, COND,4

FLDATA13, VARY, COND,0

FLDATA12, PROP, SPHT,4

FLDATA13, VARY, SPHT, 0

!\*

FLDATA7, PROT, DENS, AIR-SI

FLDATA8, NOMI, DENS,-1

FLDATA9, COF1, DENS,0

FLDATA10, COF2, DENS,0

FLDATA11, COF3, DENS,0

FLDATA7, PROT, VISC, AIR-SI

FLDATA8, NOMI, VISC,-1

FLDATA9, COF1, VISC,0

FLDATA10, COF2, VISC,0

FLDATA11, COF3, VISC,0

FLDATA12, PROP, IVIS

FLDATA7, PROT, COND, AIR-SI

FLDATA8, NOMI, COND,-1

FLDATA9, COF1, COND,0

FLDATA10, COF2, COND,0

FLDATA11, COF3, COND,0

FLDATA7, PROT, SPHT, AIR-SI

FLDATA8, NOMI, SPHT,-1

FLDATA9, COF1, SPHT, 0

FLDATA10, COF2, SPHT,0

FLDATA11, COF3, SPHT,0

!FLDA, STAB, VISC,10

FLDA, STAB, MOME,1.0

FLDA, STAB, TURB,1

FLDA, STAB, PRES,1. e-3

FLDA, METH, PRES,3

FLDA, SRCH, PRES,10

FLDA, MAXI, PRES,1000

flda, capp, pres, t

flda, capp, pmin,-9.5E+4

solve