

R D Q L

Ed Boyd

~~Col. LOONEY~~

- Use Flight Test F-18 vs F-15 data. Get to appropriate people.
- Would appear SAMP/RD should be looking at overall planning rather than individual programs
- SAMP/RD may be able to help with foreign RD efforts.

• Aero-3 performance worse than Aero-2

SFC - -3%

T. light 1.2 falls off load

BUR To Clements
and Scherhager

- Have LWF production lots
prices set before fly-off
is punched

- Should not allow Engineering
Development cost $\neq$
 - Fix Price + incentive
 - + penalties

T-P / LUF

- Give P engine differential (F100) on 505 and 405 ($1.04/1729$) vs ($1.43/1000^+$)
- same rule on 505 would be
- ($1.56/1729$)

- Also give P info on price of ~~45~~ and possible relationship to 505

- 63101 - What are we doing on Life Cycle Costing

II-T-V

13 Aug 79

- See Haver about pushing suspense items to next a little faster.
-

- Agreement between Patten and Currie that there will be one development program

- Navy interpretation they will control the program (source ADM Haver)

- Question remaining Did DDRE make such a commitment to Navy?

- Is LA Borge part of schedule

Notes

- Issue Conformal Tanks

- Issue (mission rule)
is not task oriented

- Issue - radar

- $2m^2$ vs $5m^2$
= radar specs

• The Hunt show Contractions
results are "plugged" brood
(if not this May will
do so)

- Fuel? H. & A
Fryer on 16

- Get req. for F-18 radar (compare with results)

- Use as basis for LUT/MCR radar performance

T-T-D

- F-17 has become a vehicle to subvert Nontronics -

- Basis: Sole source procurement for HUD/Sight/MCRS/TISEOL etc: all growth stems - could be more expensive than F-15

- MCRS - jet engine
health monitor from
GE (if needed)

~~Peter Linders (Leven)~~
~~Branch Chief for~~
~~VSTOL Technology~~
~~branch -~~

I-T-D

- See Ppr about new Engager
Model - if refused then
publish critique of previous
model
- Get paper from Applied Physics
Lab (APL - 2 P)
- Get P-14 distance on LAF
mission.

Staff Meeting 27 Aug 78

• Requirements Process

— Issues —

• Administratively

- Commands have only
nut picks to
forthcoming ST-7

- White paper (Inchewood,
Hansen, Murrey, Raus)
Group

- Commands should not
come in with priority
list (Raus? who)

- Draft ROCs should
not be coordinated
with AFSC

• ROLs should not be solution oriented

• Prioritization

- Have priority listings from commands
- Current Action - none (Lists have not gone outside of RD QLR)

Key
Do the Priority

1) However tried to use last in Spring Review (POV) - however not everyone was in therefore not used

2) Lists not managed by Hq USPTF

3) No plan as to how lists will be used by Hq USPTF

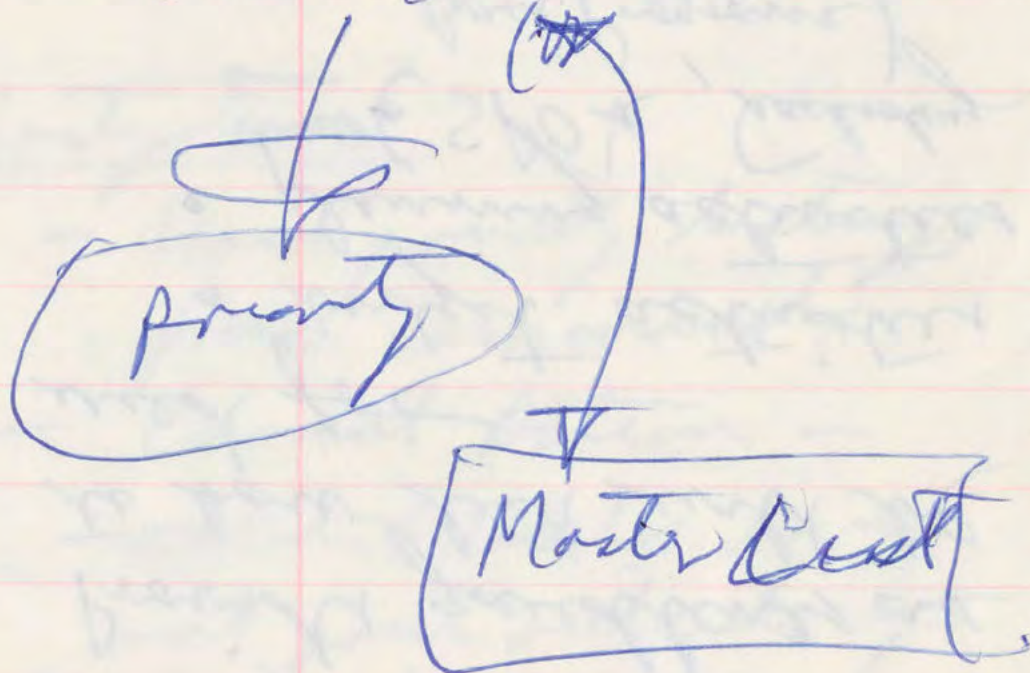
• Possibilities

- Parameters could be set
 - RRG
 - Dep FRS
 - PRG
 - AF Board Structure

• Intentions

- Develop approved AF list
- Provide guidelines as to how list will be used for
 - budget activities
 - planning activities (SPO's, Technology Base Programs) (which should be pushed)

IG - class & mod
ops - class & mod



- Working by ASTuff, ATSC
of commands
 - Set-up formal
program for RTD
(6.3 6.4)
 - Some kind of
master list like
that in ops

(See Conn)

Staff Meeting 27 May 70

- Peace Crown approved
 - Budget Brief - Quarterly
at 1330 (2 Sept)
-

- Get AFSC it's ~~from~~
new ~~SAR~~ Oct June/SAR
see Col Hunter
- Col Bill Beebe - AFSCC brief
to (Board)

IT-IT-D

- stem. you have power to meet threat - Source ETD, DIPP, CIA, DIA
- SA Study did not account for decrease performance as a result of effort
- SA Study - did not account for threat missile programs or EW or RHAU and interactions of multiple A/C
- Does not account for EW threat to A-TH-7F

$$T = T = D$$

- A-10 more capable ~~after~~
~~tests for~~ for girational
load:

★ Inconsistent with
LA Borge/Kohman position

- Composites — must be
related to costs

★ For maneuvering use ^{turn} radius
as basis for setting up
maneuver schemes.

- If maneuver near
or inside min turn
radius, max maneuver
starts out instantly
- If maneuver outside
of min radius
maneuver can be
~~softened~~ softened

re: soft maneuvers strategy
if possible

Whole new idea for
~~uncovering~~
~~uncovering~~ a basic way
for maneuvering from
initial conditions

See Sidgwick on this one

Also indicates ^{whether} ~~whether~~
an end game or not

~~Suggest means of opening~~
up engagement to softer
maneuvers

☆ - 17-75

- Suggests ~~mean~~ that maneuvers should be opened up to soften maneuvers

- Question: How can I fight someone when I am blinded and do not possess the skills of a blind man. Yet my opponent has instant access to my moves while I grope for his position and guess at his movement.

1. Why did Northrop select
18M/30K — ~~2000~~ 10000
ft apart as the initial
condition

I-T-D

2 Father

- o Navy talked to both appropriation committee
- Navy will help AF to
come up with ~~A/C~~
operational ~~A/C~~
suitable for both
services

- ~~AF~~ ~~A/C~~ AEF
is identical to
prototype and
is not operational
A/C (for either AF or
Navy or Europeans)

- jet engine necessary
for VFAX A/C
(absolutely essential)
larger engine necessary

not
acceptable

also can be used to
upgrade F-18 to
B model

This information provided
for use ~~for~~^{of} Congress
~~of A bath appropriate~~
~~Sealed~~

Sevete will push for
27.5 Million for FY 75
for (200)

for bath appropriation
committed

point that is being
exploited in committee
which is that A/C
are not large enough
for operational use

~~Key~~

Key point: Navy is

~~helping~~ AT

currently assisting the

AT in defining an

~~operational~~ A/C (A)

operational suitable

to for both services

Navy

• ~~they~~ reclama for full
\$34 million for Navy

VFAX

• Idea is that same
A/C will be used by
both services

• Navy is fully responsible
~~of congress~~ to
intent of congress
~~was~~ and admit
they were not before
because could not take
both prototypes seriously

Point: Navy is educating
the committee members
~~that~~ Did not criticize
any action taken

Navy will save DOD
and Congress from
making a serious
mistake

Recommendation —

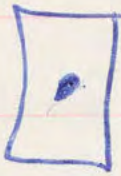
Maule

- Rader
- Ruzer
- RS

Briefing

- Significant PDD items that will affect results
- Coordinate with AC and PR.
- See Ben Evans at 0930

- Letts to OSD to join committee banner
 - What are we doing
 - entry



~~Defense~~



Both appropriation
committee. Defense
subcommittees

Friend

Preston - chief
counsel of Pepl
subcommittee
(Mahon)

Wag

Minority
chief
counsel
previn

Gunn - chief
counsel of H.C. DeLoach
Senate of Subcommittee

Game - neutralize the
senate

- Game the House

a strong case

• Concern - they may
not want to
meet with us
- they are in
conference

• Hard copies of
executive summary
of briefing

• Homework set done

• Key Point - Took a great
deal of time in many iterations

• Indirectly been involved
all the way.

• Impression impossible
to doubt fact

- Gray trade off

- contractor trade off

- Compare results

- Remove discrepancies

- Fly prototypes

- Results prove

conception is

valid

~~Stop~~

- Such an effort

cannot be

done quickly

~~at this~~

Try before
buy

It takes time ?

- Evolve concept
- Do the Trade-offs
- Verify the concept
- Extensive effort shows it is ~~also~~ worthwhile

- And even then it
took 2 1/2 years.
Still faster and
more successful
than previous
programs.

- First in history
that prototypes
do what they
are supposed
to do!

- ~~Have~~ make contact
thru baldwater or
Stennis (Symington)
or Cannon
Cannon

Use personal contact

- However we have demonstrated that the concept was a ~~success~~ unique success
- First time in history they've gone with such remarkable success

2. So we've proven the thoroughness of the conception, trade-offs ~~and flight test~~ ~~and~~

Underlying message

- paper studies cannot do what we have done in the past couple of years

Both NASA and Industry
also involved

Way by Hardy come-up
fully justified ~~Way~~
minimum Navy needs
imposed upon AEF

- o ASD/XR - Corner approach problem
- o EM
 - USAF vs Navy Variants
 - USAF Stretched v Navy Rec ^{stretch} stretches
 - USAF vs ASD/VFA Design
- o Look at AEF Raders for USN Application

~~IFTA~~

AFT Briefings

5

- Fundamental of A-A Combat Purpose:

- Comparisons (Performance)

Purpose: Show F-15, 16, 17 dramatic performance advantage of F-15, 16, 17 over ~~the~~ contemporary aircraft

- ~~Consideration of Differing Results from Digital simulation, manned simulation and Real World ~~combat~~~~

- different
- Consideration of ideas embodied in EM and differing results associated with digital simulation, manned simulation and real world

and Implications of these ideas
computer results with regard
to possible future tactics.

- Show relation

~~T-F-0~~ 11 Sept 72



- Try to come up with a common set of specs to produce a common a/c.

•• How far does Navy go on LWF mission

- Feb/Mar - Used in ADVACS study 1988 threat - SAM-0

- Radar - 30 NM - based
 (What about relative range) upon ATM - 7 F Range
 • What about relative range

? { What is the threat
 radar missile range }

- What m^2 should we use?

- Jim Foster - Says Navy outnumbered by enemy building outstanding fighters - Radar R
 • Why not use threat philosophy

- May says AF is carrying on Radar Requirement

• Radar spec is quoted for
what alt./M point and
 m^2 }

• What about quoting spec
at higher alt./Mach
point where life will
be operating? }

In fact let us assume
a range of alt./mach
points against an
array of radar &
sections — a full
parameter!

Q.

• Out of full radar
parameter of alt/mach
 km^2 - Where will
we most likely operate?

• Considering radar missile
performance what is its
max range against
~~an array~~ Targets at
~~various~~ alt/mach
combinations? Is it
different? Does range
increase with altitude?
~~If so then~~ has this been
accounted for in BVR
and in determining needs
against threat? (radar
and missiles)

- What is Trade off in scaling a/c up to gain 30 NM (or whatever) is appropriate value) range in terms of increased cost and decreased performance. Compare this with keeping a/c the same size.
- What is difference between detection and lock-on ranges? | Should lock-on range ~~be~~ be higher (maybe detection range is sufficient)
- What impact will TWS have on Detection and lock-on ranges, ~~but~~ susceptibility to jamming

Does every a/c need a radar missile

- What as range of APM-7F at various alt/track points from sealevel to 40 or 50000 ft.

• May Concept

- Radar - May playing games

- VTAS - support Able

• Radar Threat Search/Track

• 12 m² ~~+~~

• No Lookdown

• MX — How large a Target —
= About Radar X section
for missile #s

• BVR

— Radar Detection
vs Lock-on

— Threat radar ranges

— ADU-7F launched and
scored prior to Soviet
missiles

- Force model
 - No ECU
 - No RTHW
 - No ?

- SO capability for threat as like our ATR - TF DIA does not cover

- Jun Foster

- ~~Off~~ Range ≈ 7 NM beyond launch range (3000' per down)
- Velocity search radar (H/F PRF)

- VFAX model / MC ATR



+

• Trade-off — FCV vs
radar missile

• Exchange Patrols for
only SO mode only

• Foster admits they'll be
outnumbered

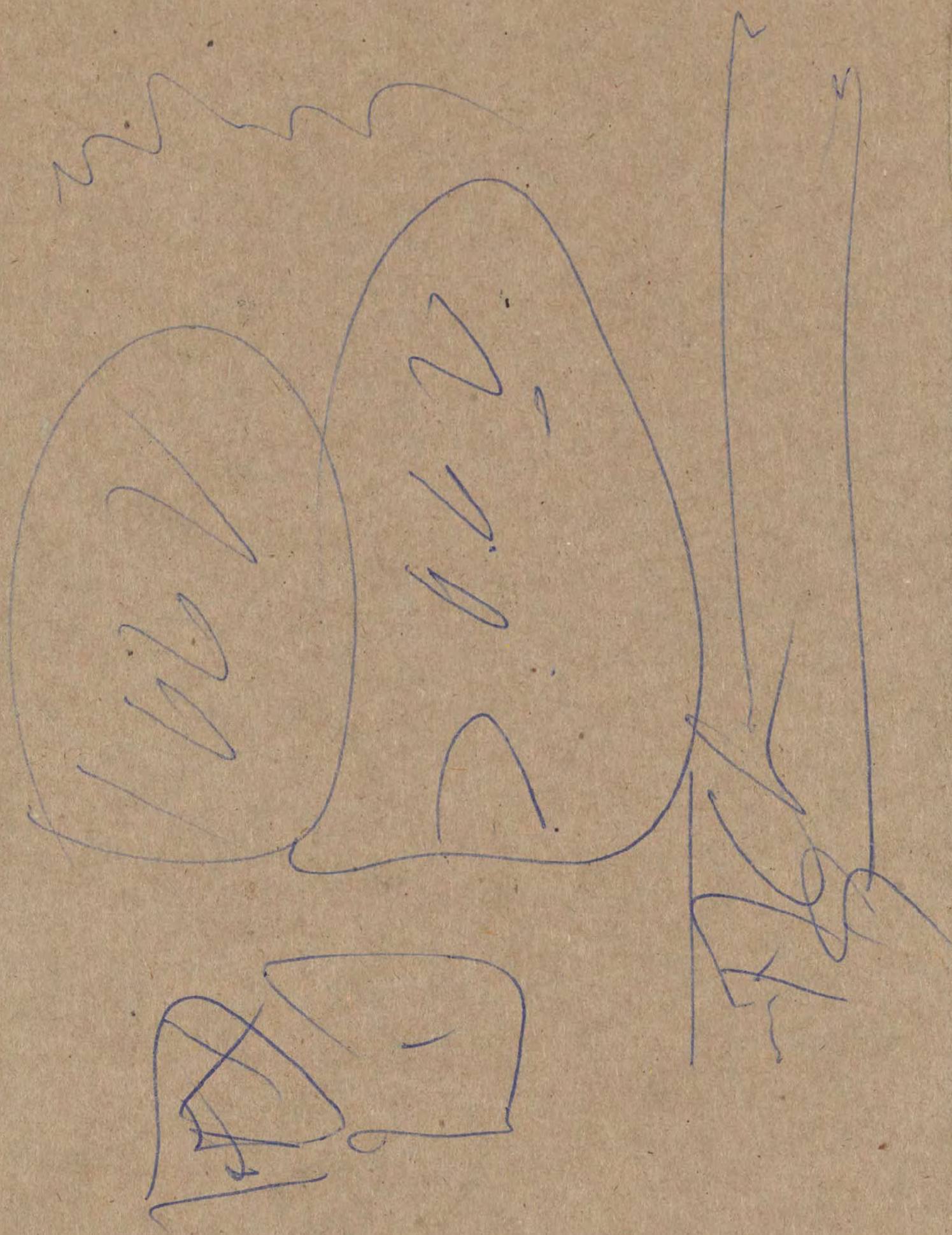
• Even with threat (SMM
missile (SMM?) — Day
still wants 4500
Block R (SMM?)

• Should we use CW
illumination with DT radar
— What are the trade

- o Navy desires for Radar/Threat
- look/shoot 2
look/shoot 2 before
bad guy fires
(48 NM)
- o Navy minimum Radar/Threat
- look/shoot 2 before
enemy can shoot
(30 NM)

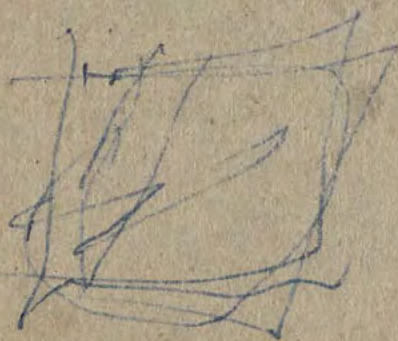
- * Navy analysis does not
consider impact of these
- close-in
 - numbers
 - EW, RADM
 - \$ Trades

Example: M-14 vs M-16 rifle
European Tank v US Tank
fire requirements.





P651-455



My CB Corr 1A AF

•

EM

Optimum chart

AP6C-66-9

86

70

60

50

~~708~~

~~730~~

708

660

533

149

710

142

13200

Yal Weiss 55820
75630

EM for
Coral magnet

18 20
20 18
15

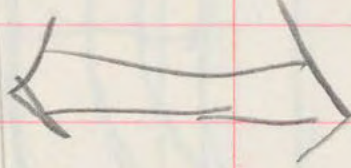
63,000 HL

315000
/

F14B

F15

STAND OFF



CLOSE IN FIGHT

MANEUVER

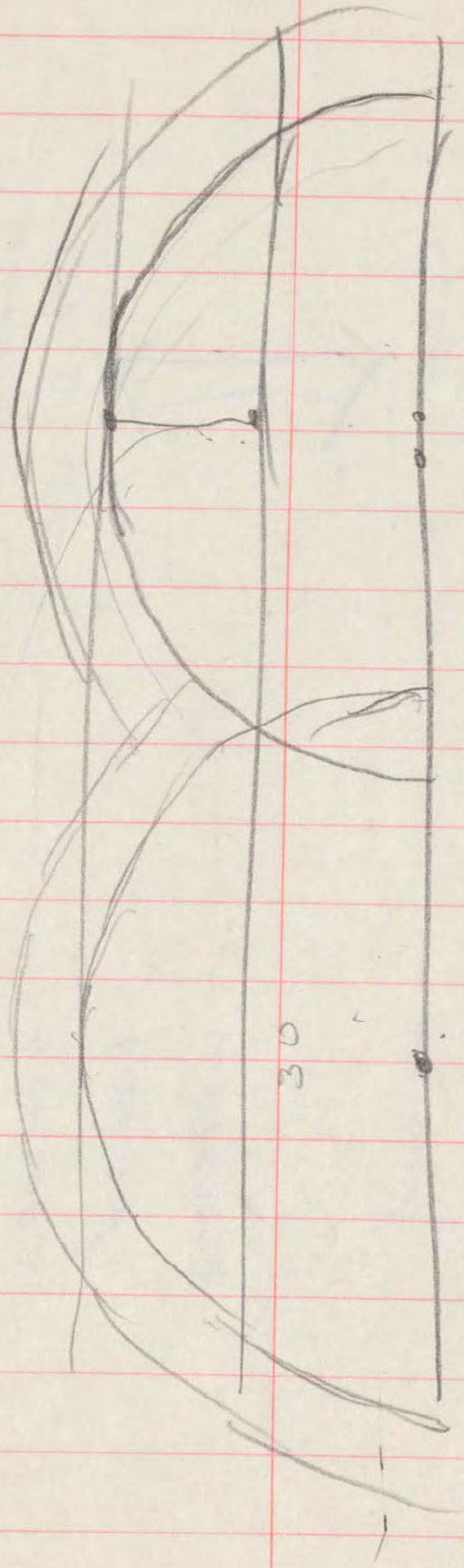
FACTORS

SENSORS

REACTION

WEAPONS

1.75



30

9.8 mm

F 14 B

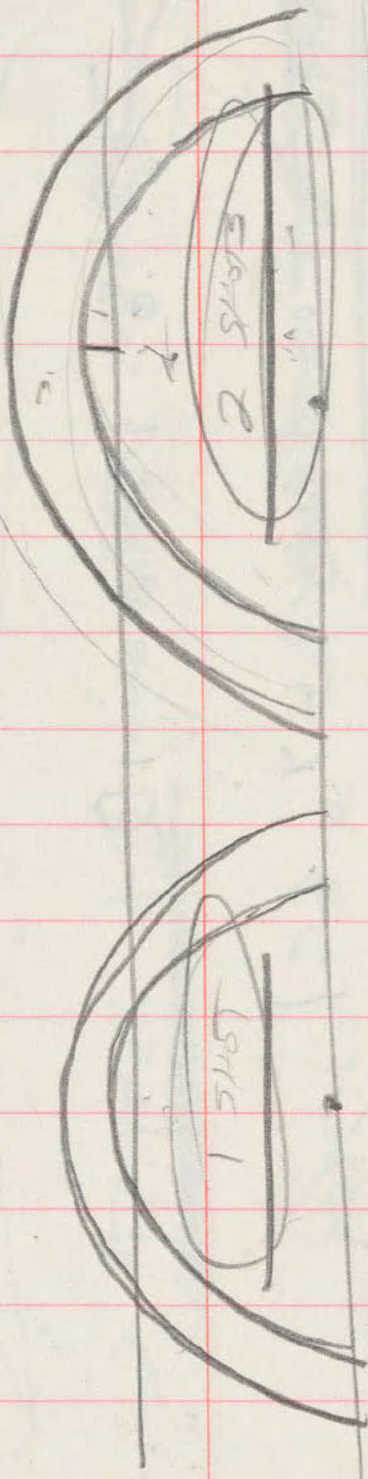
5.2 mm

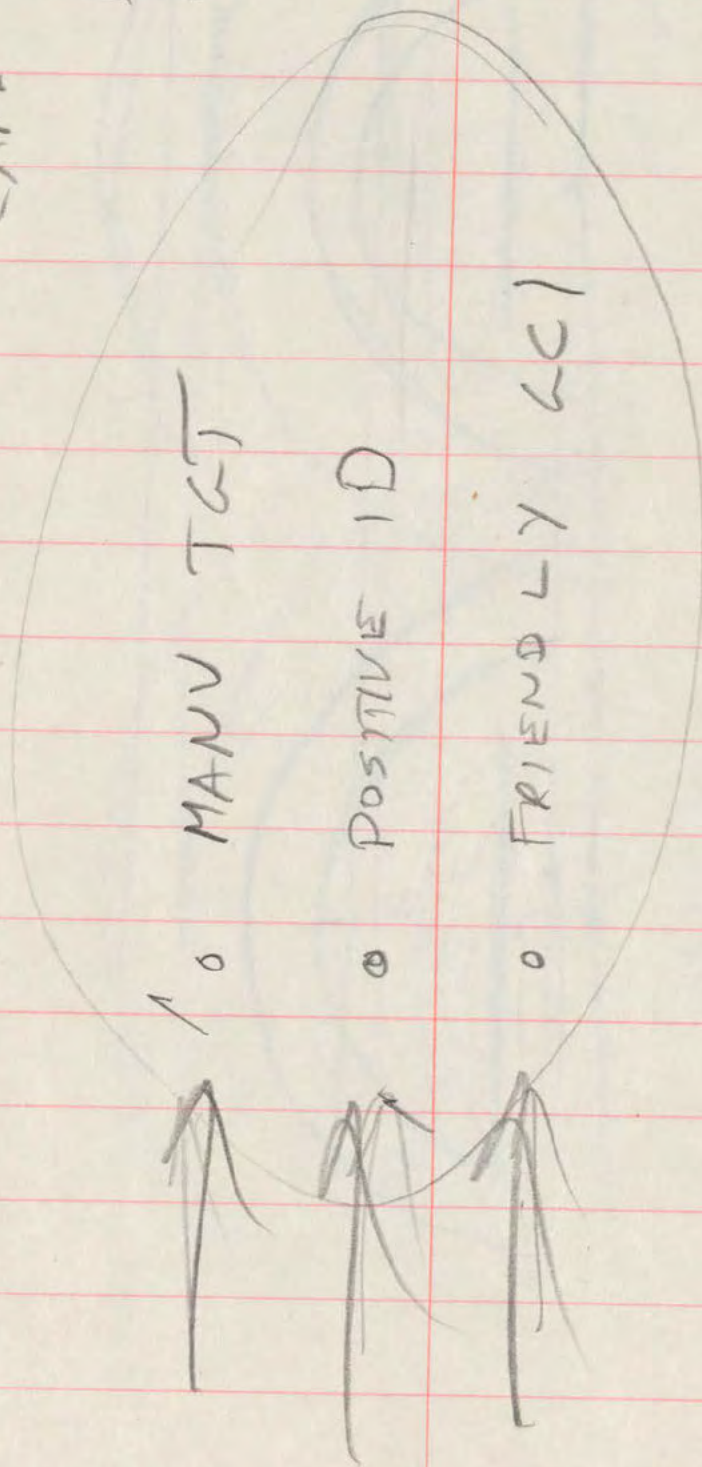
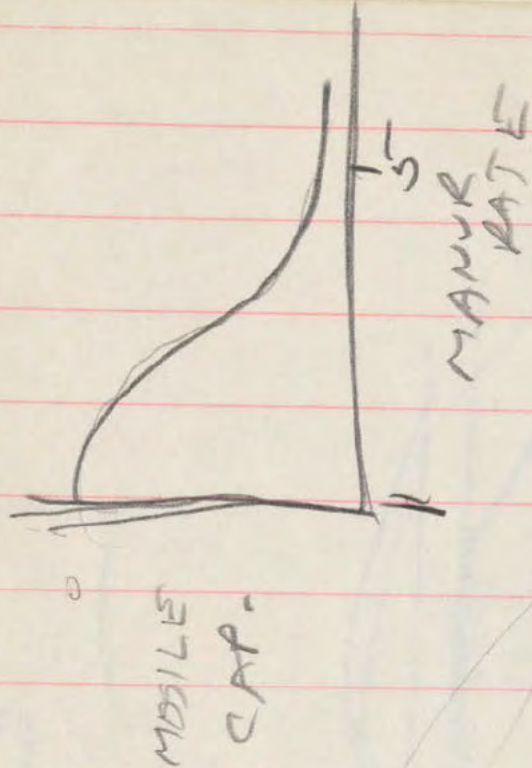
2.0

PERIOD LINE

100

100





→ CONUS — HIGH

→ THEATER AD — VIRT NONE

HOSTILE AIR — COUNTER TO STAND OFF

19

F 14

9

15

~~15~~

Gen only
4 billion

PKB

102

F. 15

VS

T&H

.56

6

373

B 1.1/80 VS

VS

T

.54

8

231

A .8/9 VS

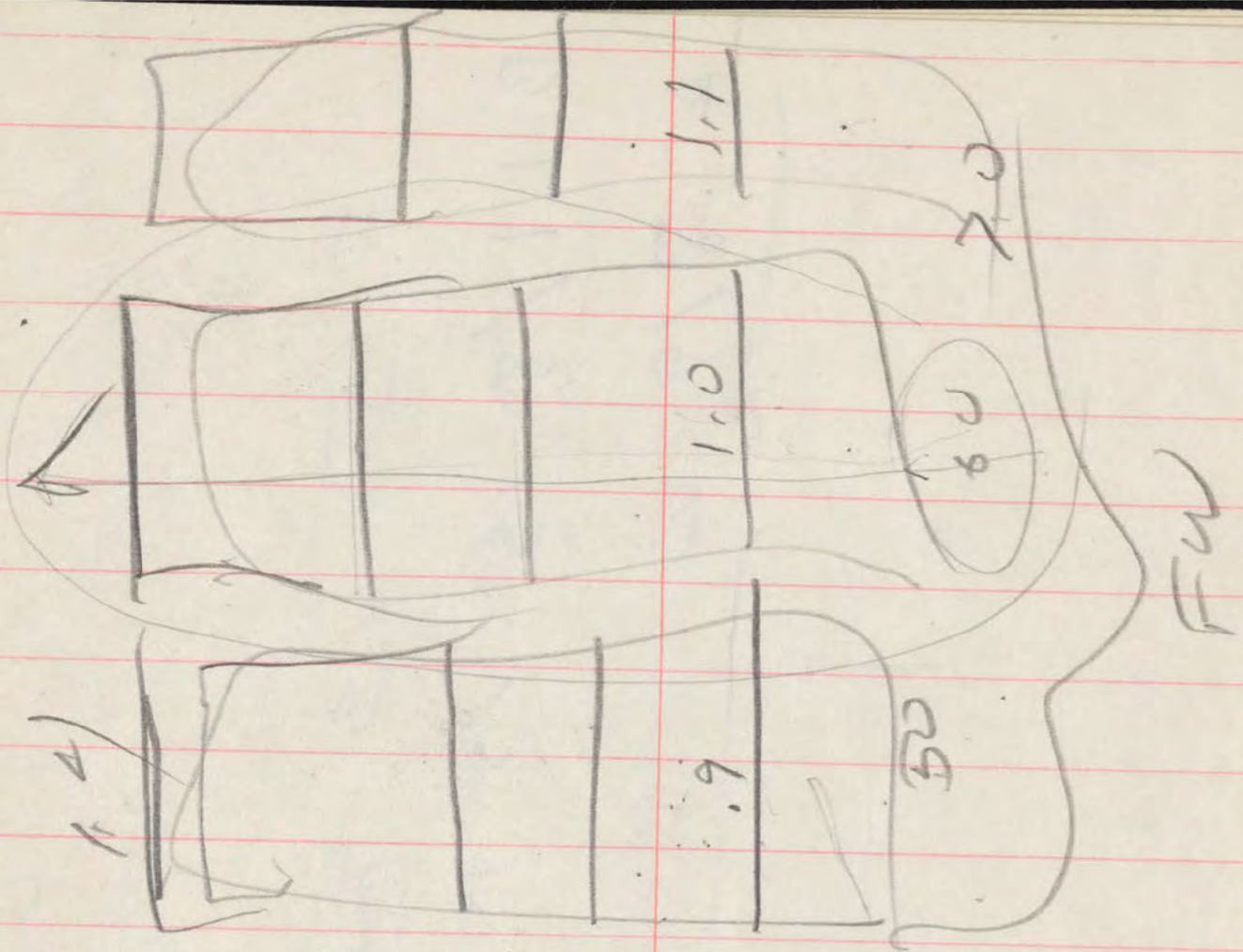
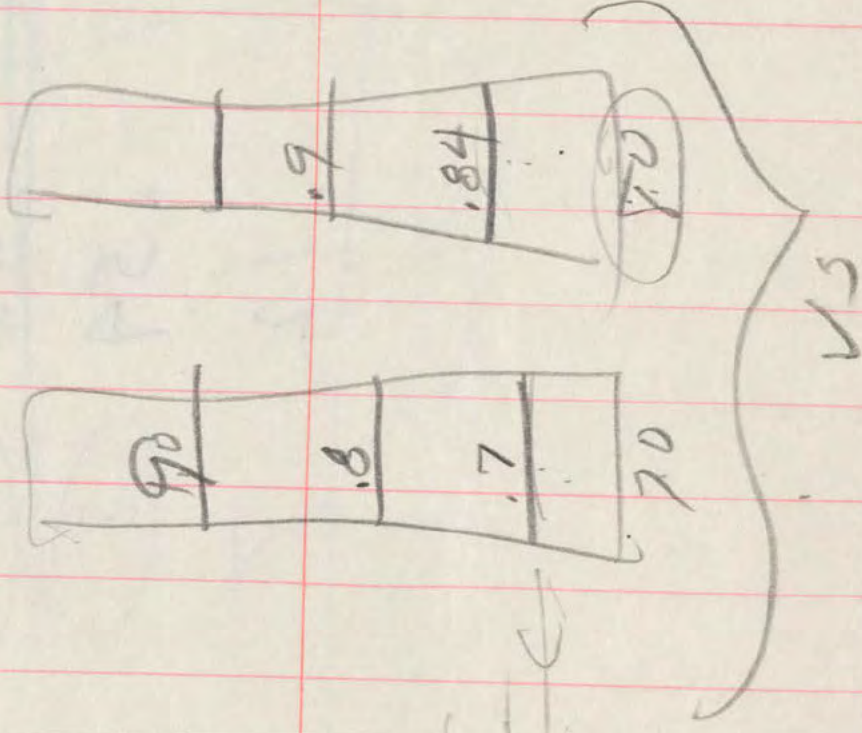
T

.12

7

50

ΔPK



$$u = \frac{V_s u_t}{S}$$

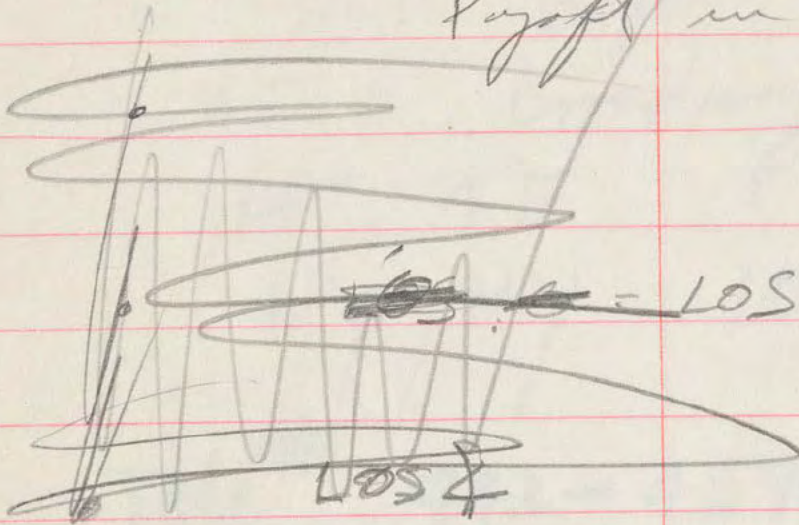
$$u = \frac{2000}{S}$$

$$N = \frac{V_s u_t S}{g S}$$

$$N = \frac{(22.5 \times 10^4)}{(9.8)(36,000)}$$

$$N = \frac{2.28}{(6.68)(.30)} \cancel{10^4}$$

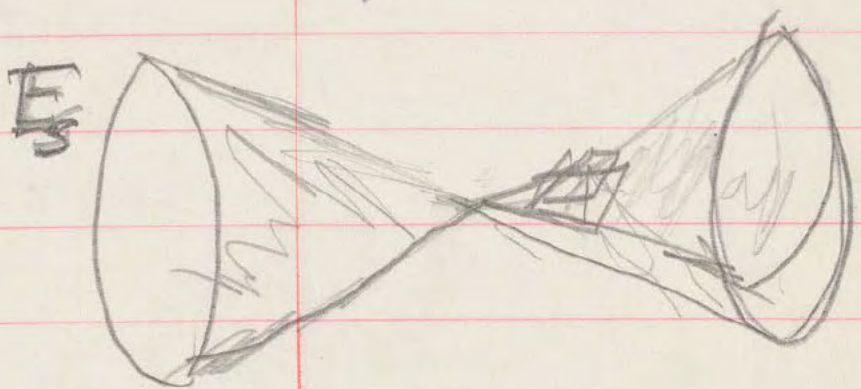
Payload in time / fuel



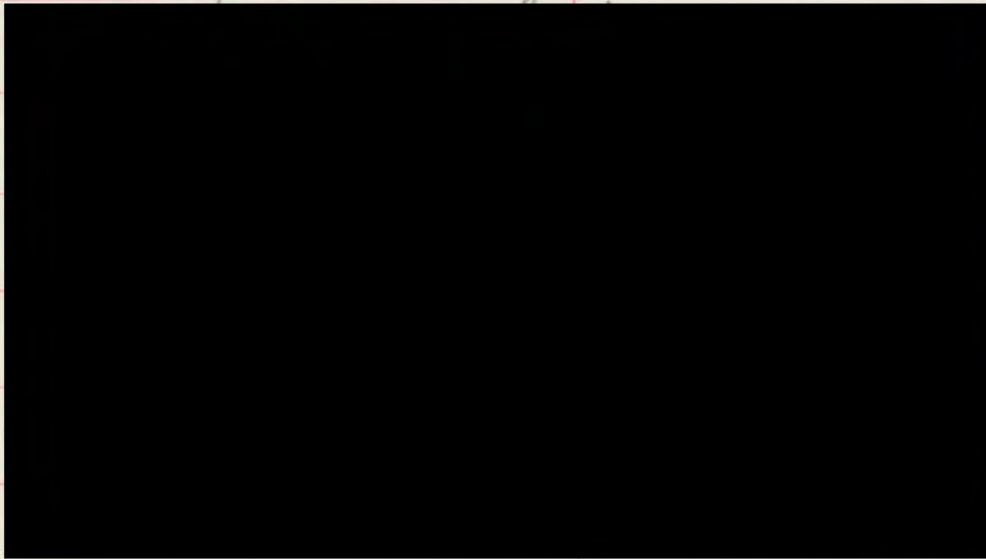
$$\bullet \quad \text{LOS} = \text{LOS}$$

$$\bullet \quad A = f(V, \text{LOS})$$

$$\bullet \quad S = S_{\text{range}} \quad \left(\begin{array}{l} \text{Trans} \\ \text{Steady} \end{array} \right)$$

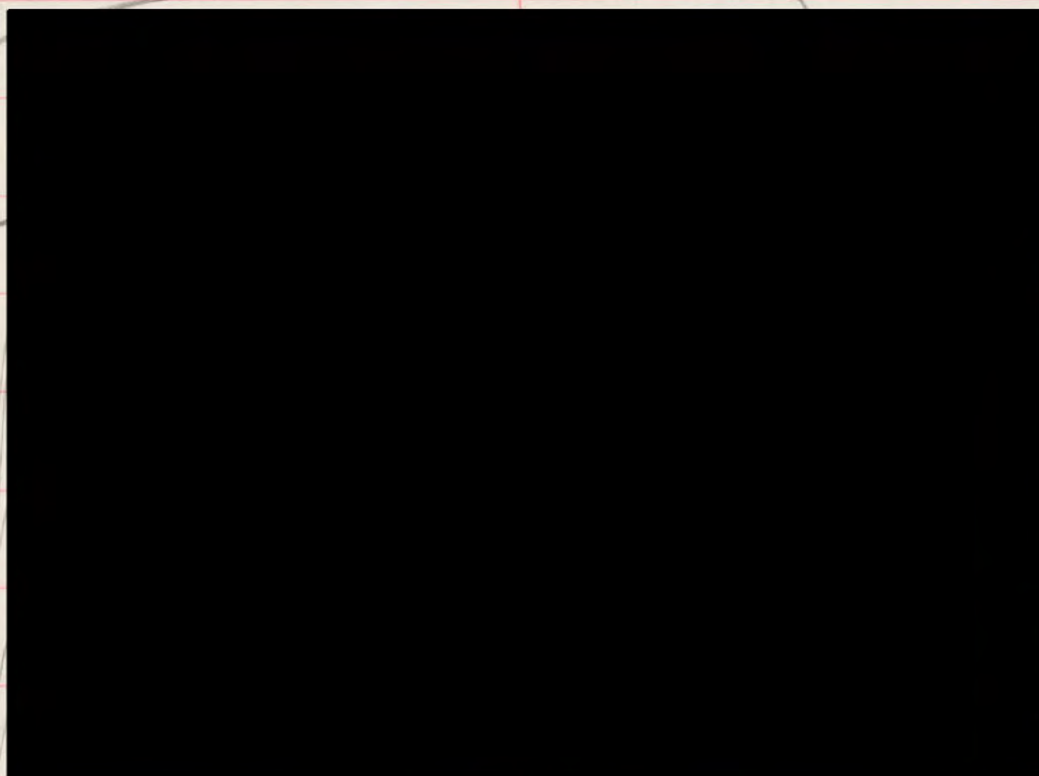


Ann Boyd



4/col James L
22498

Thompson Jr.



T-T-0

• ~~AD~~ PPM - 6 Rhodamine

8.1

6

$$\frac{P_s}{R} = \frac{(T-D) \frac{1}{w}}{\frac{v}{a}} =$$

$$\frac{a(T-D)/w}{v} = \frac{a}{vw} (T-D)$$

$$\frac{a' \frac{L'}{w} (T-D)}{vw} = \frac{g}{vw^2} (T-D) L'$$

$$a' = \dot{\theta} v$$

$$\left(\frac{T-D}{w}\right) a' = \dot{\theta} v \left(\frac{T-D}{w}\right) = \dot{\theta} P_s$$

$$\left(\frac{T-D}{w}\right) \frac{L'}{w} g = \dot{\theta} P_s$$

$$K L' (T-D) = \dot{\theta} P_s$$

F 4E

FB

$$\begin{array}{r} 62200 \\ \hline 37200 \end{array}$$

F 9

$$\begin{array}{r} 9955 \\ \hline 31655 \end{array}$$

F 9 1.4

$$\begin{array}{r} 519 \\ \hline 343 \end{array}$$

1.28

$$\begin{array}{r} .519 \\ .337 \end{array} = \begin{array}{r} 1.68 \\ 1.4 \end{array}$$

$$\frac{(1600 + 900)(1600 - 900)}{64 - 32}$$

$$64 - 32$$

$$\begin{array}{r} 1600 \\ 900 \\ \hline 2500 \end{array}$$

$$\frac{(2500)(700)}{64 - 32}$$

$$64 - 32$$

=

$$\begin{array}{r} 1594 \\ 896 \\ \hline 698 \\ 1599 \end{array}$$

$$(2699)($$

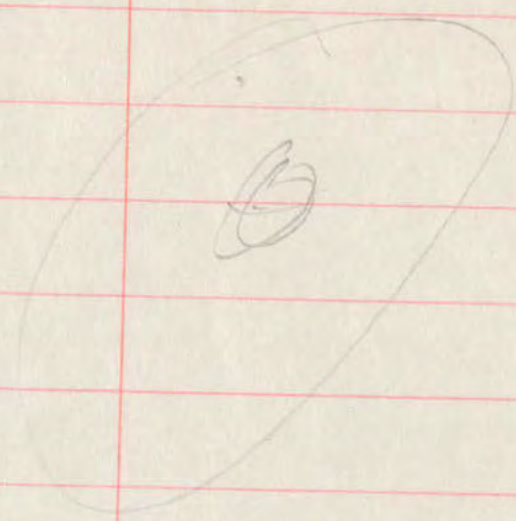
$$\begin{array}{r} 1594 \\ 896 \\ \hline 2490 \end{array}$$

$$(2990)(698)$$

$$27,000$$

V

1



o

R



~~u~~ (uxv)

$$N = \frac{u \cdot v + S \cdot u \cdot \theta}{g \cdot S}$$

will be selected

— strategies —

- Pursuit (lag, pure, lead)
- Callaway's Corner
- perceptive Navigation

— How does model run —

— command path from
evader then iteration
for best path by pursuer
Evader then finds best
path against pursuer
path.

— Call Pateras — see if
they have differential
game.

$$\frac{\theta}{P_s} = \frac{P_s}{\theta} = \frac{\mu_{\text{max}}}{K_y / \text{sec}}$$

$$\frac{P_s \text{ in } \theta}{\theta} = \frac{\text{ft} \left(\frac{\#}{\text{sec}} \right)}{\text{deg/sec}}$$

$$\frac{\text{ft} \# / \text{sec}}{\text{deg/sec}}$$

$$\frac{(\text{ft/sec})(\text{lb/sec})}{\text{deg/sec}}$$

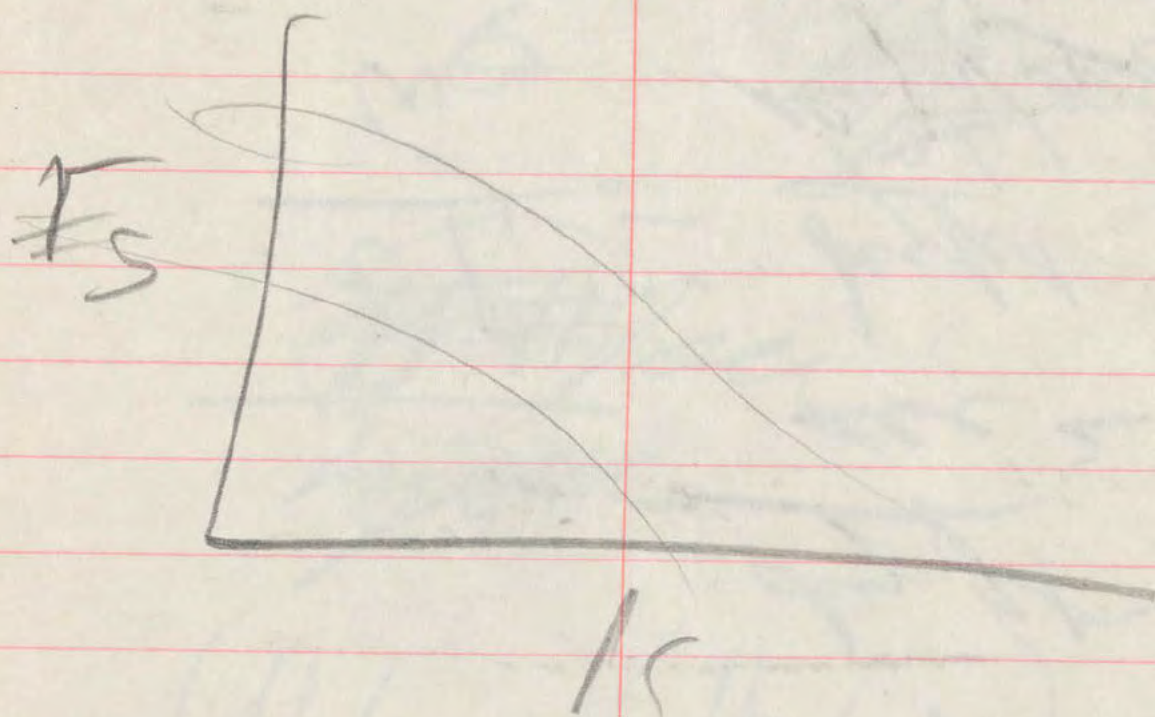
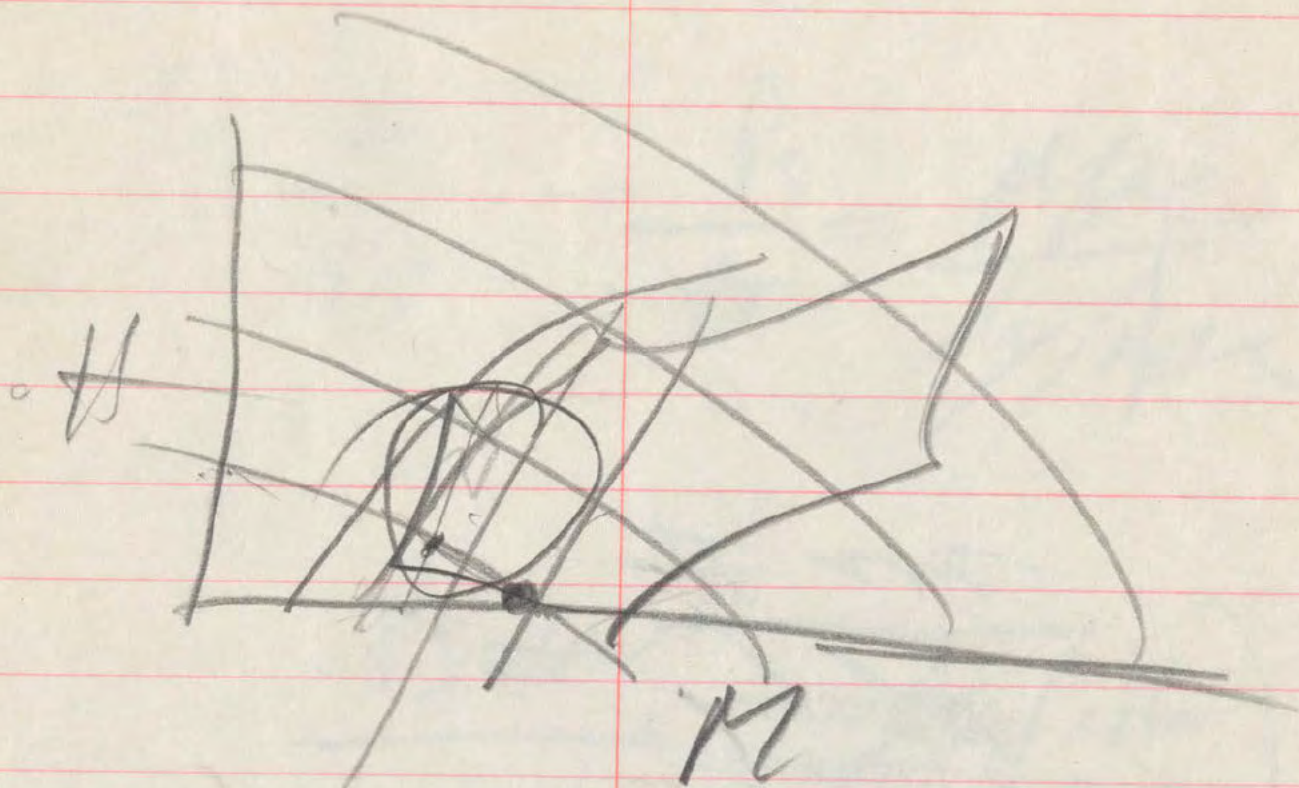
$$\rightarrow \frac{\text{ft-lb/sec}^2}{\text{deg/sec}}$$

$$\dot{\theta} P_1 = \text{deg/sec ft/sec}$$

$$\frac{\text{deg ft}}{\text{sec}^2}$$

$$\frac{\dot{\theta} P_1}{\omega} = \frac{\text{deg ft}}{\text{sec}^2/\text{sec}}$$

$$= \frac{\text{deg ft}}{\text{ft/sec}}$$



$$\frac{PSW}{\theta}$$

$$\frac{\theta PS}{u}$$

$$\frac{2L}{2D} = \frac{L}{T-D}$$

$$\left[\frac{2L}{2D} = \frac{L/D}{T/D-1} = \frac{C_L/C_D}{T/D-1} \right]$$

$$V = ER \quad T/W / D/W$$

$$R = \frac{V}{\sigma}$$

HLD

$$\theta P_s = \frac{2N'}{\cancel{\mu}} \left(\frac{T-D}{\cancel{\mu}} \right) \cancel{\mu}$$

$$N' = L/\omega$$

$$\frac{(2)}{\omega^2} L' (T-D)$$

$$\bullet \quad \frac{R}{\beta} = \text{Min} = \frac{\frac{v}{\gamma} \omega'}{\left(\frac{T-D}{\omega}\right) \gamma}$$

$$v^2$$

$$L' = \omega \omega'$$

$$= \frac{v/\gamma}{L'/\omega (T-D)/\omega} = \frac{(v/\gamma) \omega^2}{L' (T-D)}$$

$$= \frac{K}{L' (T-D)} = \text{Min}$$

$$\approx \text{May } \frac{L' (T-D)}{K}$$

$$(T-D) \partial L + L (-\partial D)$$

$$(T-D) \partial L = L \partial D$$

$$\frac{\partial L'}{\partial D} = \frac{L'}{T-D}$$

VVS

0.6 1.2 / 5.00

1.1 / 7.33

1.0 / 10

0.8 / 14.3

0.6 / 17.1

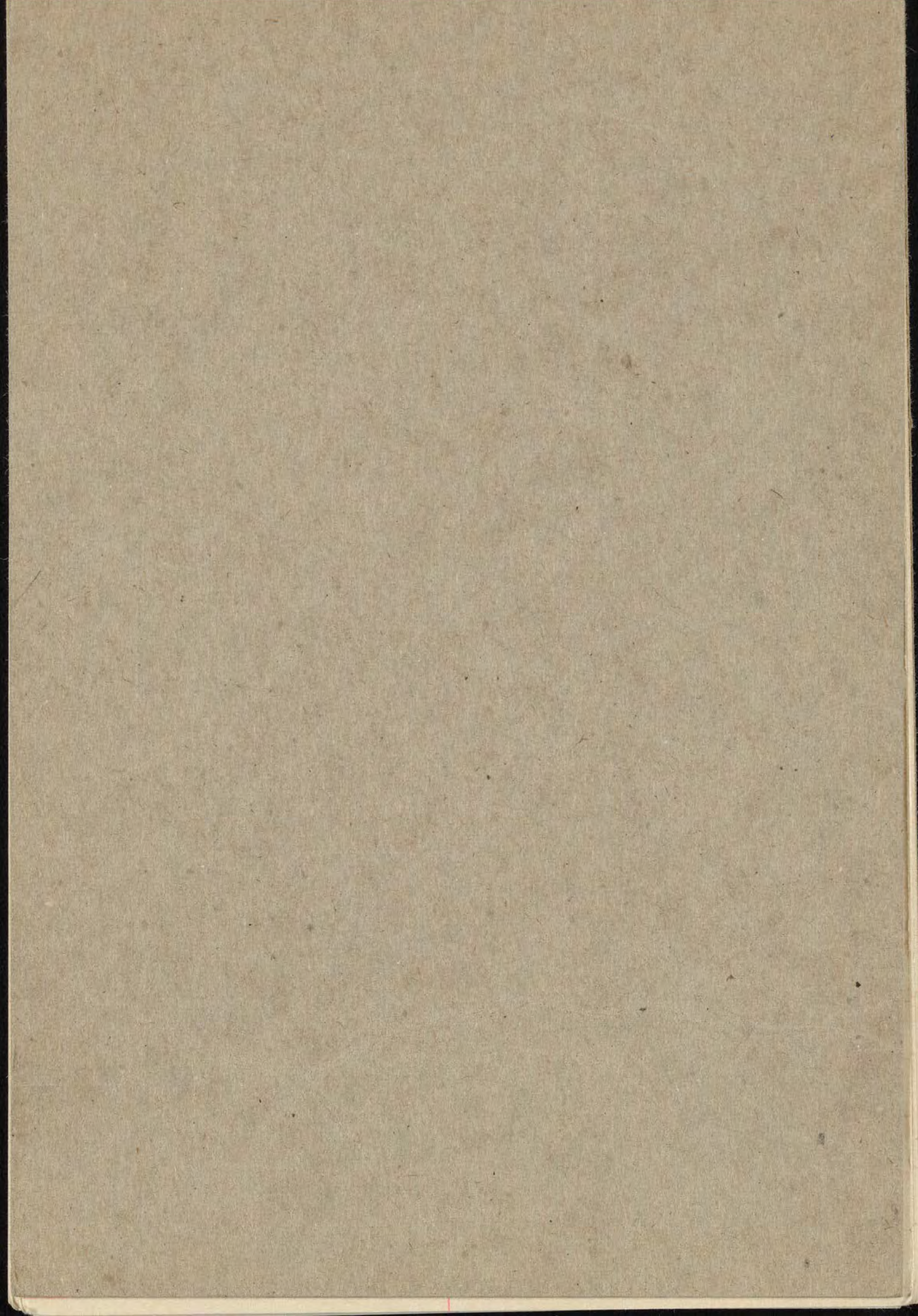
FS

7.88 / 6.36
~~7.22 / 7.76~~
7.22 / 7.95

6.54 / 8.82

5.25 / 10.9

3.94 / 13.1



Ps Mc

~~Ps~~
Ps



Get copies back

- ~~Handle on low key~~
~~(put calls into various~~
~~people)~~

- ~~Get OSS copies back~~

- Call Benji Jorgensen and
get copies back (quietly)

- Think in terms of other
questions

LB II

•) ~~Dark~~

•) ~~Dark~~ ~~XXXX~~

•) ~~ck P-38 / zero~~

•) ~~Write ? S for Kelly~~

AL
212

VI 7-1426

1) vanis-mada nangle far
T dyflichon schem.

Briefing

1) Gen. Roalgen / Gen. H. van
Jae Jones / Gen. Smith
Gen. Ball

Low Bell II

Jae Jones Low Bell II

1938

1 hour

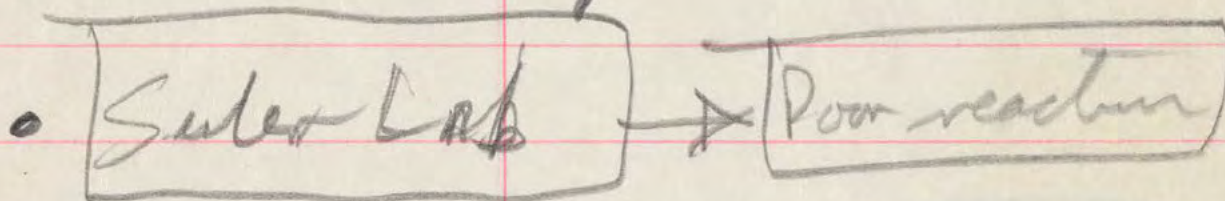
Meeting

99

- Have not come up with scenarios that we can depend.

1st slide

- What are penalties instead of



$$w = \frac{360 \text{ g.w.}}{3000} \frac{\$1000}{3000}$$

$$w = \frac{1}{30} = 2\%/\text{sec}$$

30 sec

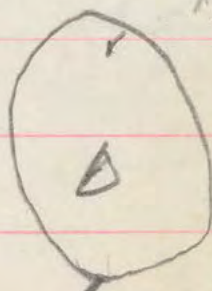
0
20

2% / sec

480

2

20



3.5

1.4

1.2



Tactical test to ?
see what YF-12 1

Studied CFP > th speed

97. • Used to take FB
- Assume role

• Rate of acceleration }
- questions

$$L(T=0)$$

$$(T=0) \frac{dL}{dT} + dL(T=0) = 0$$

$$\frac{dL}{dT} = - \frac{L}{T}$$

$$dP_s = w dP_s + dw P_s = 0$$

$$\frac{w}{P_s} \neq w + \frac{dw}{dP_s} P_s = 0$$

$$w \frac{dP_s}{dw} \neq P_s = 0$$

$$dP_s = - \frac{V}{w} dD$$

$$dD = C_d g S$$

$$2D = 2C_d g S$$

$$\partial P_s = - \frac{V g S \partial C_d}{w/S}$$

$$\partial w = \frac{\partial N!}{\partial N!}$$

$$\partial w = \frac{V \partial N!}{\partial N!}$$

$$\frac{\partial P_s}{\partial w} = \frac{v^2 g \frac{\partial c_0}{\partial w/s}}{g \frac{\partial N'}{\partial w/s}}$$

$$N' = L/w = \frac{c_L' g s}{w/s}$$

$$\partial N' =$$

$$\partial N' = \frac{\partial c_L' g}{w/s}$$

$$\frac{\partial P_s}{\partial w} = \frac{v^2 g \frac{\partial c_0}{\partial w/s}}{g g \frac{\partial c_L'}{\partial w/s}}$$

$$\frac{\partial P_s}{\partial w} = \left[\frac{v^2}{g} \frac{\partial c_0}{\partial c_L'} \right]$$

$$\omega \frac{\partial P_s}{\partial a} - \left(\frac{\cancel{2}N'}{\cancel{2}} \right) \frac{v^2}{g} \frac{\partial C_1}{\partial C_L}$$

$$N' = \frac{L'}{\omega} = c_L' g S$$

$$\left(\frac{c_L' g S}{\cancel{\omega}} \right) \frac{\partial C_1}{\partial C_L}$$

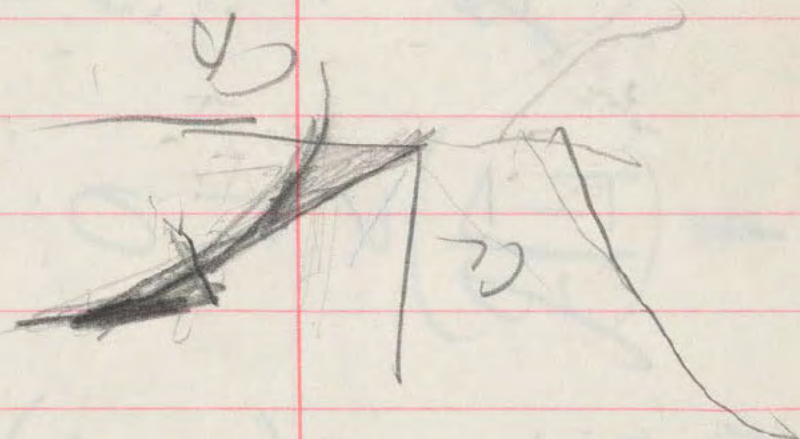
$$+ \left(\frac{T-D}{\cancel{\omega}} \right) \omega = 0$$

$$\frac{\partial C_1}{\partial C_L} = - \frac{(T-D)}{g c_L' S}$$

$$\frac{\partial C_1}{\partial a} = \left(\frac{T}{D} - 1 \right) \frac{c_L' g S}{\cancel{c_L' g S}}$$

$$\frac{18 \frac{1}{2}}{100} = \frac{18}{100}$$

100

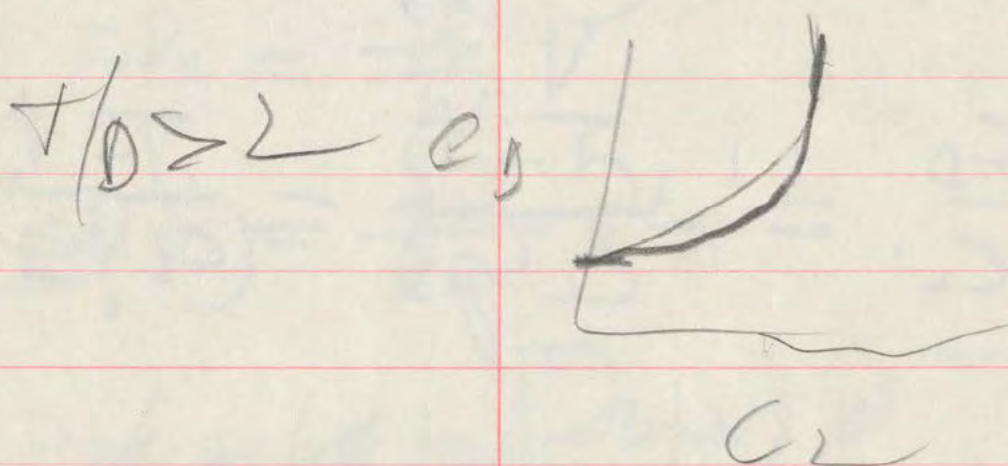


$$\frac{18}{100} = \frac{18}{100}$$

$$R \quad \left| \quad \frac{\partial C_D}{\partial C_L} = \frac{C_D}{C_L} \left(1 - \frac{I}{D} \right) \right.$$

$$P \quad \left(\frac{\partial C_D}{\partial C_L} = \frac{C_D}{C_L} \left(\frac{I}{D} - 1 \right) \right)$$

$$\frac{\partial C_L'}{\partial C_D} = - \frac{C_L'}{C_D} / \frac{I}{D} - 1$$



$$T-D + \frac{L'(-\partial D)}{\partial L'} = 0$$

$$L' = C_L' g S$$

$$\partial L' = \partial C_L' g S$$

$$\partial D = C_d g S$$

So

$$T-D - \frac{(C_L' g S)(\partial C_d g S)}{(\partial C_L') g S}$$

$$\frac{\partial C_d}{\partial C_L'} = \frac{T-D}{C_L' g S} = \frac{T-D}{(C_L' g S)} \frac{D}{C_d}$$

$$\frac{\partial C_d}{\partial C_L'} = \frac{C_d}{C_L'} \left(\frac{T-D}{D} \right) = \frac{C_d}{C_L'} \left(\frac{T}{D} - 1 \right)$$

$$\dot{\theta} P_s \text{ Hay} =$$

$$P_s \frac{\partial (\dot{\theta} P_s)}{\partial C_L} = 0$$

$$P_s \frac{\partial \dot{\theta}}{\partial C_L} + \frac{\partial P_s}{\partial C_L} \dot{\theta} = 0$$

$$P_s + \dot{\theta} \frac{\partial P_s}{\partial \dot{\theta}} = 0$$

$$P_s = \left(\frac{T-D}{w} \right) V$$

$$\dot{\theta} = \frac{g N'}{V} = \frac{g L'}{V w}$$

$$\partial P_s = \frac{-\partial D}{w} V$$

$$\partial \dot{\theta} = \frac{g}{V w} \partial L'$$

$$\left[\left(\frac{T-D}{w} \right) V + \frac{g L'}{V w} \left(\frac{-\partial D}{\partial L'} \right) V \right] = 0$$

med

W:000 → G Hog.

P

$$\frac{\partial C_L'}{\partial C_D} = \frac{C_L'}{C_D} \left(\frac{I}{D} - 1 \right)$$

R

$$\frac{\partial C_L'}{\partial C_D} = \frac{C_L'}{C_D} \left(1 - \frac{I}{D} \right)$$

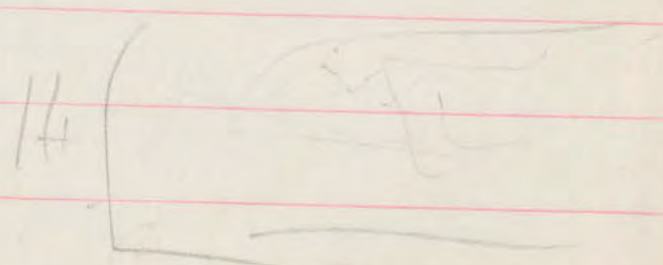
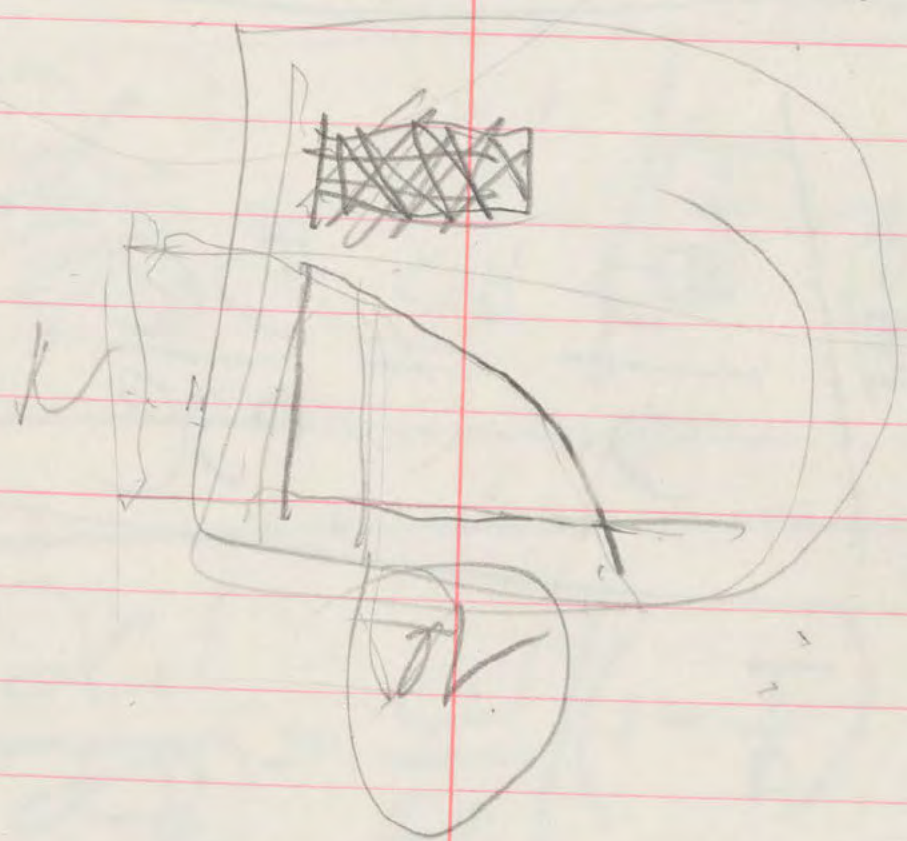
$$\frac{B}{B} = \frac{r_e}{r_e}$$

$$\left(1 - \frac{r_e}{r_e}\right) / \frac{r_e}{r_e} = \frac{r_e}{r_e}$$

$$\frac{m}{s}$$

$$p_s$$

$$\frac{\partial C_L'}{\partial C_D} = \frac{C_L'}{C_D} \left(\frac{I-1}{D} \right)$$



$$\text{Max } L'(T-D) \quad \text{Max } \frac{L'}{T-D}$$

$$(T-D)\partial L' - L'\partial D = 0$$

$$T-D = L' \frac{\partial D}{\partial L'}$$

$$L' = c_l' g s$$

$$\partial L' = \partial c_l' g s$$

$$D = c_d g s$$

$$\partial D = \partial c_d g s$$

$$T-D = \frac{(c_l' g s)(\partial c_d g s)}{\partial c_l' g s}$$

$$\frac{\partial c_d}{\partial c_l'} = \frac{T-D}{c_l' g s} = \frac{T-D}{c_l' \left(\frac{D}{c_d}\right)}$$

$$B^{4/3} - R^{4/3} = b_0 - R_0^{4/3}$$

$$B^{4/3} - 8.5 = 2950 - 1160$$

$$B^{4/3} = \begin{array}{r} 2960 \\ 1170 \\ \hline 1790 \end{array}$$

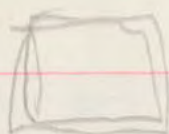
$$B = (1790)^{3/4}$$

$$B^{1.28} - (89)^{1.28} = 2150 - 880$$

$$B^{1.28} = 2158 - 880$$

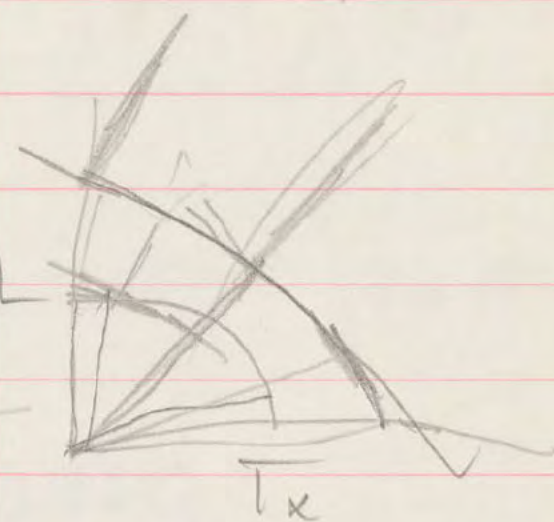
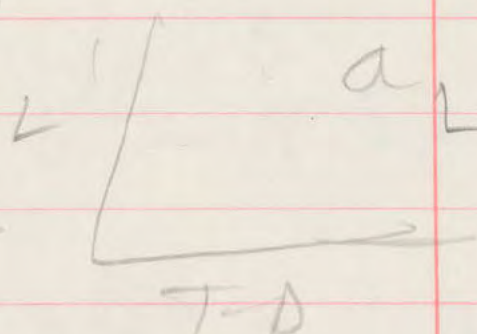
$$B =$$

$$\begin{array}{r} 2158 \\ 880 \\ \hline 1278 \end{array}$$



OP - 1

$$\frac{dV}{dP} = \frac{dV}{dP}$$

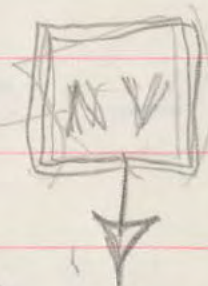


-

$$a_T = (a_W^2 + a_L^2)^{\frac{1}{2}} \left(\frac{n}{t} \right) \left(\frac{n}{t} \right) \left(\frac{M}{T} \right)$$

$$\partial A_T = \partial A_W + \partial A_L$$

$$\frac{\partial A_T}{\partial A_W} = \frac{\partial A_T}{\partial A_L}$$



$$a_P = \frac{V}{R} \quad a = \frac{V^2}{R} \quad w = \frac{V}{R}$$

• $\dot{\theta} P_S = 1$ = Maximum when?

$$\frac{\partial(\dot{\theta} P_S)}{\partial C_L'} = 0 \quad \text{or}$$

$$\boxed{\frac{\partial C_L'}{\partial C_D} = \frac{C_L'}{C_D} \left(\frac{T}{D} - 1 \right)}$$

• $\frac{\dot{\theta}}{P_S}$ = Maximum when

$$\frac{\partial(\dot{\theta}/P_S)}{\partial C_L'} = 0 \quad \text{or}$$

$$\boxed{\frac{\partial C_L'}{\partial C_D} = \frac{C_L'}{C_D} \left(1 - \frac{T}{D} \right)}$$

$$\frac{L}{T-D} = \text{Max}$$

$$(T-D) \partial L' + L' \partial D = 0$$

$$(T-D) + \frac{L' \partial D}{\partial L'} = 0$$

$$L' = C_L' g S$$

$$\partial C_L' = \partial C_L' g S$$

$$D = C_D g S$$

$$\partial C_D = \partial C_D' g S$$

$$\frac{T-D}{\partial C_L' g S} = \frac{(C_L' g S)(\partial C_D' g S)}{\partial C_L' g S}$$

$$\frac{T-D}{C_L' g S} = \frac{\partial C_D}{\partial C_L} = - \frac{T-D}{C_L' \left(\frac{D}{C_L'} \right)}$$

$$\frac{\partial C_D}{\partial C_L} = \frac{C_D}{C_L} \left(\frac{-T+D}{D} \right) = \frac{C_D}{C_L} \left(1 - \frac{T}{D} \right)$$

$$L'(T-D) = n a v$$

$$\partial L'(T-D) + L' \partial D$$

$$(T-D) - L' \frac{\partial D}{\partial L'} = 0$$

$$(T-D)' = C_L' g s$$

$$\partial L' = \partial C_L' g s$$

$$\partial D = \partial C_D g s$$

$$D = C_D g s$$

$$T-D = \frac{(C_L' g s)(\partial C_D g s)}{\partial C_L' g s}$$

$$T-D =$$

$$D = C_D g s$$

$$g s = D / C_D$$

$$\frac{\partial C_D}{\partial C_L'} = \frac{T-D}{C_L' g s}$$

$$\frac{\partial C_D}{\partial C_L'} = \frac{T-D}{C_L' D} = \frac{C_D}{C_L'} \left(\frac{T}{D} - 1 \right)$$

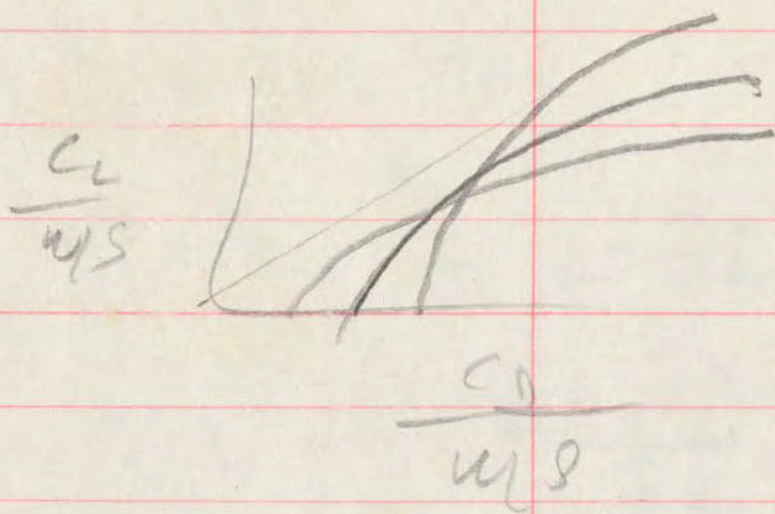
(P)

$$\frac{\partial C_L'}{\partial C_D} = \frac{C_L'}{C_D} \left/ \left(\frac{T}{D} - 1 \right) \right.$$

or

(R)

$$\frac{\partial C_L'}{\partial C_D} = \frac{C_L'}{C_D} \left/ \left(1 - \frac{T}{D} \right) \right.$$



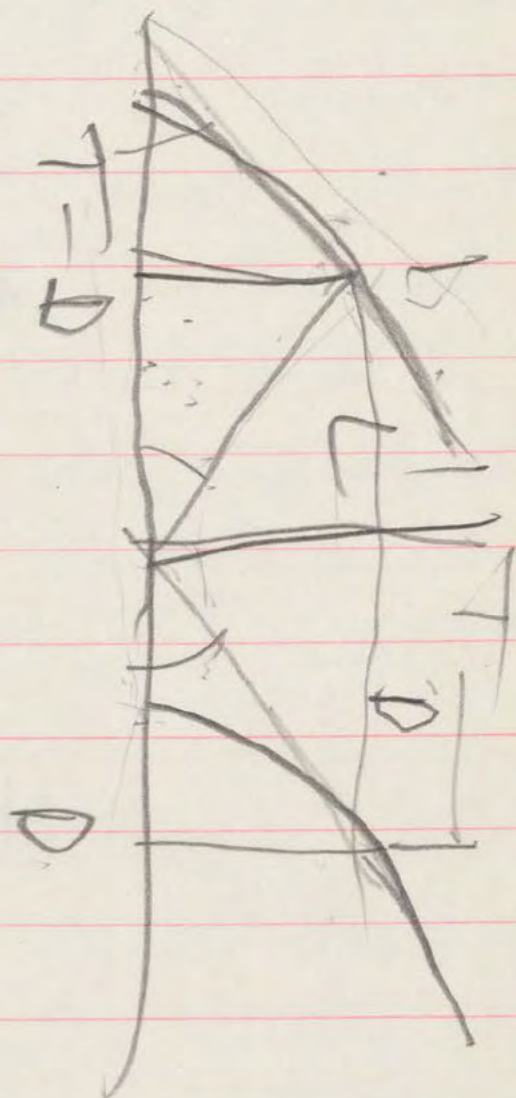
$$N = C_L \cancel{g/s/w}$$

$$\frac{D}{w} = C_D \cancel{g/s/w}$$

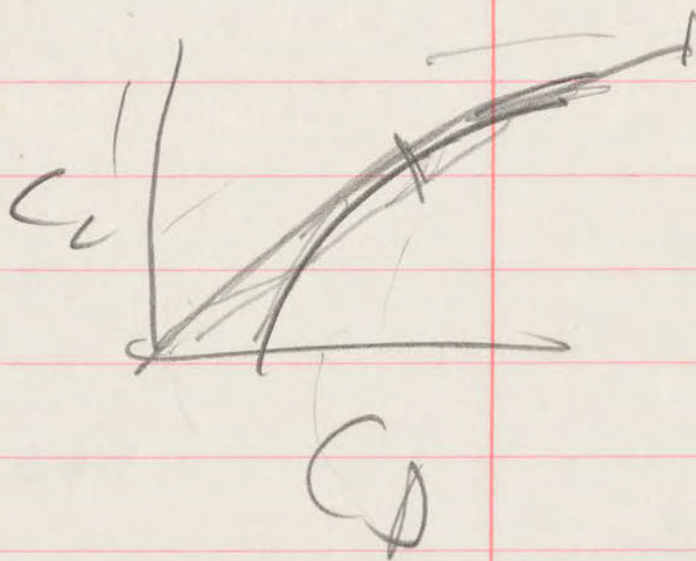
$$\frac{N}{g} = C_L/w/s$$

$$\frac{D/w}{g} = C_D/w/s$$

θ $\frac{1}{f}$ $\frac{1}{2}$
 $\frac{1}{2}$ $\frac{1}{f}$ θ



HM



3 things

C_i / C_d

May

D count in intercept
configuration

Open

FD

*

$$v/c = \sqrt{2(E_k/E_p) - (E_k/E_p)^2}$$

$$E_k/E_p = 0, \quad v/c = 0$$

$$1) E_k/E_p = .1 \quad v/c = .436$$

$$2) E_k/E_p = .2 \quad v/c = .6$$

$$3) E_k/E_p = .3 \quad v/c = .714$$

$$4) E_k/E_p = .4 \quad v/c = .80$$

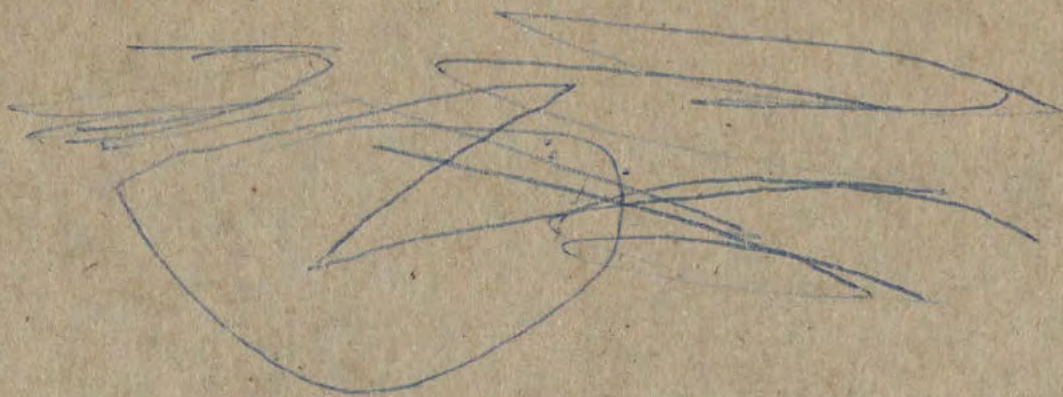
$$5) E_k/E_p = .5 \quad v/c = .866$$

$$6) E_k/E_p = .6 \quad v/c = .917$$

$$7) E_k/E_p = .7 \quad v/c = .954$$

$$8) E_k/E_p = .8 \quad v/c = .980$$

$$9) E_k/E_p = .9 \quad v/c = .995$$



24



STENOGRAPHIC NOTEBOOK

29



steno notes

GREGG RULED

ITEM NO. HG-2272

A PRODUCT OF **Westab** DAYTON OHIO
GRIPPER EDGE® SLIP PROOF

BOOK NO.
FROM
TO

I-T-D

- Missile Envelopes

- Aero Limit
- Seeker Limit
- Max Rel Range Limit
- Maneuver Limit

- Are all the above limits accounted for in data provided so far?

- E.W.

- See Hood -
- How susceptible is ADOT-7F to EW.
-

T-T-D

- F-X wing is being set primarily due to structural weight bind - Why

- TOGW - set
- engine - set
- Radius - set
- Specifications & Equipment - just about set

Result: possibility of getting wrong wing and being unable to compete against threat or Navy is degraded.

- New schedule aggravates problem since wing is fixed and no time to change, result studies being co - Result -

- Overall result wrong wing

• Overall result.

- Wrong way will be selected
- Briefing on design concept is meaningless and advantages of TS over US becomes distorted
- Our position vis-a-vis the Navy is weakened

• Differential Game.

- Payoff (time, fuel, energy)
(hr) (hr) (hr)
- ^P Conditions (θ, λ, S)
- Model - 3DOF
- NO optimum strategy (only a given strategy)

T-T-D

- F-X wing is being set primarily due to structural weight bind - Why

- TOW - set
- engine - set
- radius - set
- specifications & Equipment - just about set

~~Result~~ Result. possibility of getting wrong wing and being unable to compete against threat or Navy is degraded.

- New schedule aggravates problem since wing is fixed and no time to change, result studies being co - Result -

- Overall result wrong wing

• Engine

- Design loads (normal longitudinal, pitch)
no greater than R/C loads and capability
- Fuel coolers (or heaters)
- low cycle fatigue
- stable low speed operation at high α
(slower than 1G envelope)
- blade containment
- engine matching for Ps in transonic
region
- Emphases .9, 1.2, 1.6 with 0.6
and 2.2 having less importance

• Structures

- Design load factor (6.5 vs 7.33)
- Fatigue (9000 hrs scatter factor of 2)
- Placard (SL + overspeed, H_1 alt)
- Inlet ΔP (also not for H_1 & at H_1 much)
- * - Sink = 10 FPS @ ? internal fuel
- Design load factor at max TOGW
Gca load $\leq 3G$
- Hard points
- Material (titanium etc)
- ~~Resonant tests to destruction~~

- Component testing to destruction prior to production to prevent proliferation of safety factors

• Performance

- 0.6/10/S, 0.9/30/S, 1.2/30/S, 1.6/35/S
- Auto hi lift devices
- Manuever @ Hi Mach (2.2)
- Radius (230 or 260 or external)
- Max Speed + over speed at SL and alt.
- low speed stability and control (Des)

• W

• Weapons

- Sp and ATM-9 a SRM on some loadouts
- Gun (20 mm or 25 mm - 600 rds/4000 RPM)
- AG weapons and manuever requirement

• Miscellaneous

- CBR (big wheels & volum air int)
- Hook (E or R) 1.1 VS
- ESD (only when needed)
- APU w/ after starter (let fuel accumulate)
- BITE
- RCS, IR reduction etc

- Tank explosion suppression
 - foam, nitrogen purge, bladders v internal fuel tanks in fuselage
- pilot armor
- refueling receptacle
- Future growth reserve
 - ECS, power, etc.
- press. suit.
- Mission fuel rules
- cockpit cooling and other air conditioning requirements.

Dynamics

- Radar (cone) (LCSD) - 30" (range display)
- Navigation
- ECM
- ID (IFF, EIFF, ATAR)
- Communications (Data link, scrambler)
 - (UHF - VHF backup)
- Gunsight (Disturbed v Director)
 - (standard LCOS)
- Displays (HUD, HSD, VSD, CRT,
- Instruments (analog vs type)

- IACS (or not)
- Computer (central or not)
 - separate AIC, intercept command, navigation
- SAS
- Autopilot
- Auto activation

- AG load factor a fallout
- Hard points qualified for ~~available~~ design load factor not higher

T-TD

- Get GD, MDC, Lockheed proposals to ~~surface~~ any other trades.
- Brief on US broil to B. Bolles
- Check mission rules
- Emphasize ammunition impact on F-15, ~~the~~ (M-118 only fallout etc)

WTR

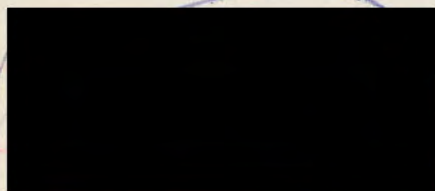
RT

RFP

- Incomplete DR & HR → 10 Oct 69
- Negotiate Spec. → 29 Oct 69
- A Cost Impact → 24 Oct 69
- Submit Cost proposal → 17 Nov 69

* OTL

- New
- Packard not want to resign to inhibit later on
 - ADC see later on
 - No resign of A/C (BB)
 - Packard support of this effort



NDR

redaction ~~S~~

* Air Vehicle Hattyslepage - Why?

Inertial Navigation -
- AHRS

Carbon brakes - too expensive
(steel instead)

Stores mounting

APU starters

Data -

* scaled state - ~~Franchise~~
cut saving + \$

Reduce Titanium add cut

Add 3000psi instead of 9000psi

NTBF

New TACAN vs existing

FH - Republique

- Primary performance the same
- Secondary " relaxed
- Cutaneous 90% - 15%
- Fuel system vulnerability star
- Vulnerability - obsolete
 - 350K and 306S sewing
- EO Tracking high risk
 - 50K - 100K ~~before~~
 - high risk
- EIFF out - 70%
 - obsolete
- Radar warning
 - 1 sec. for sorting to
 - 10 sec for initial sorty and
 - 1 sec opti
- Detects Data link
- UHF Bup out
- Mechanical HSD instead of
Electronics
- Use standard THERM
- Detect 1 decoy dispenser

- Reduce data size \$ - to be accomplished

- GFF (Gross/Fine)
- Counters (1 to 2)
- Combine even counters w/ (odd process)
- Direct ETRF, T.W. (copy/plan)
- Direct HMF, HHS, Miller's Log
- Elements TIRAP update (nodes)
- Launch SCA D' FOU
- TATTS
- Single PRF
- DA IFF
- Beacon Mode
- Velocity stop against map
- TCS coupling
- word naming
- H/G - 1 SNA

9600
2400
4100

Δ Horonics

[WP]

- He Prof. Cent Bed (F-8 mod)
- Return 100% burn in (reduce sample)
- GFE Comm / Nav
- Computer (1 & 2)
- Combine scan convert w/ radar processor)
- Discard EITFF, IRW, chop/flush
- Remove IUTFF, HRS, Multi scan display
- Eliminate THERO update (Radar)
- Launch SRM 12° FOV
- FOITS
- Single PRF
- AA IFF
- Beacon Mode
- Velocity stat expand map
- ILS coupler
- voice warning
- A/G 1 SMS

$$S = \frac{V \cdot V_{SHUT}}{g \cdot n} = \frac{144 \times 10^5}{32.2(6)} = \frac{1.98 \times 10^6}{193.2}$$

$$\begin{array}{r} 193 \overline{) 1440000} \\ \underline{1381} \\ 990 \\ \underline{965} \\ 250 \end{array}$$

$$\begin{array}{r} 1.2 \\ 1.5 \\ \hline 7.5 \\ 1.5 \\ \hline 7.25 \end{array}$$

7500 @ 12 $\angle$ 90°
3750 @ 12 $\angle$ 30°

$$S = \frac{2.25 \times 10^6}{200}$$

$$\begin{array}{r} 193 \overline{) 2250000} \\ \underline{1931} \\ 319 \\ \underline{193} \\ 1270 \\ \underline{1158} \\ 120 \end{array}$$

6000

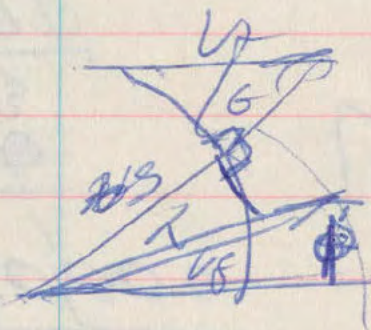
12000 @ > 1.5 $\angle$ 90°
6000 @ > 1.5 $\angle$ 30°

$$\sin \alpha = \frac{V_s}{V_m} \sin \theta$$

$$\sin \alpha = \frac{1}{2} \sin \theta = .5 \cdot .5 = .25$$

$$\sin \alpha = .15^\circ$$

$$\theta = \phi + \alpha$$



$$\phi = \theta - \alpha$$

$$\sin \phi = \frac{V \cos \theta - V_s \sin \theta}{S}$$

Subtract
horizontal velocity

$$\phi = \frac{V \cos \theta - V_s \sin \theta}{S}$$

$$\phi = \frac{V + S \sin \theta}{S} \left[1 - \frac{V_s}{V_m} \sin \theta \right]$$

$$\phi = \frac{V + S \sin \theta}{S} [1 - kR]$$

$$S = \frac{V + V \sin \theta}{g \mu} \left[1 - k \right] \left[1 - \frac{k \cos \theta}{\sqrt{1 - k^2 \sin^2 \theta}} \right]$$

$$\theta = \dots = \sqrt{1 - k^2 \sin^2 \theta}$$

$$\phi = \theta - k$$

$$L \cos \theta = k \cos \theta$$

$$k = \frac{k \cos \theta}{\sqrt{1 - k^2 \sin^2 \theta}}$$

$$k = \frac{V \sin \theta}{V}$$

Question reduced to capability / not enhance - Army tactics

$$\phi = \theta \left[1 - \frac{k \cos \theta}{\sqrt{1 - k^2 \sin^2 \theta}} \right]$$

$$\phi = \frac{V \sin \theta}{g \mu} \left[1 - k \right] \left[1 - \frac{k \cos \theta}{\sqrt{1 - k^2 \sin^2 \theta}} \right]$$

$$\phi = \frac{g \mu}{V f}$$

$$\frac{g \mu}{V f} = \frac{V \sin \theta}{g} \left[1 - k \right] \left[1 - \frac{k \cos \theta}{\sqrt{1 - k^2 \sin^2 \theta}} \right]$$

Doctors/parents

• off brought lunch / argue

2) • off brought lunch / brought argue

• brought lunch / argue

1) Doctors/parents



RD HOC
NAR - response

- Steel/carbon brakes - A131C
- not recommended
- Accessory gear box w/o attachment
to engine

• reduced power

- 40NM $\rightarrow$ 33NM
- $\dot{\theta} = 150 \text{ M/rev} \approx 270/\text{sec}$

$$\begin{aligned} & \left[\frac{\partial (P_{\theta})}{\partial V} \right]_{E_s, C} \stackrel{\pm D}{=} 0 \\ & \text{or } \left[\frac{\partial (P_{\theta})}{\partial V} \right]_{E_s, C} = 0 \end{aligned}$$

* Ben tongue = Booner
tall & thin

* External stores = 7.33
Why

* 10-2 place F-15
(14% present)

X Range

X L Load Factor

Notes on Friday meeting

- Ask contractor selected about deviations once again

- Management milestones
— & must be reviewed
—

- cheaper higher quantity aircraft

PK
PS

A PK

A PS

- Pressure for delay

- Shrink of C as possible for more secret lower

— with contractor

— simple contractor

OSD - list of questions to
shrink d/c

20 Oct 69

- Belts brief to Gurner
and crowd

- ~~Go over serv~~

- — Procedure —

- Go over serv in detail

- Go over Selin memo

- Acceleration requirement
(1 min)

* Radar

- What if it crops out,
- What to do
- What about false alarm rate to auto acquisition



- Search out HUD FOV

* TEWS

* TISEO →

- Specify contract Transfer function

* FCS

- Below say 1500' 2nd order not available (order noise)
- Beyond the same value 2nd order possible

* 2.2/2.5

- 2.3 $\rightarrow$ 2.2 relaxes future development
- 2.2 without high G requirements

- * Aluminium assembly
- bump = 2 ~~in~~ / reg.
 - not 3 G TO Reg.
 - new brake requirement

* 7.336 with tanks
(bat)

* also roll rate with external stores and ~~7~~ 6

* Max load limit instead of 15%
vs 5%

* 10 ffs gear @ 38K or 50K

- * engine
 - fore/aft G requirement possibly too high (Wag)
 - vertical loads - 10 G maybe less consistent with 7.33 G
 - Take blade containment away
 - combined loads & low cycle fatigue should be looked in to.

* Run out those external internal missions

* Decision points and milestones should be operationally oriented

$$C_d = C_{d0} + C_d^2$$

$$L = C_L f S$$

$$\frac{L}{w} = N = \frac{C_L f}{w/s}$$

$$C_L = \frac{(N)(w/s)}{f}$$

$$C_d = C_{d0} + K \left(\frac{(N)(w/s)}{f} \right)^2$$

$$h = \left(\frac{T \cdot h}{w} \right) v$$

$$C_{d f S}$$

$$P_S = \delta P_S$$

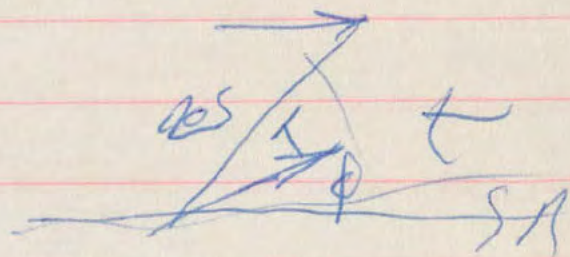
$$\frac{40}{3}$$

$$\dot{\phi} = N \dot{\theta}$$

$$\phi = N \theta + C$$

$$\dot{\phi} = N \left[\frac{v_A \sin \alpha_0 - v_f \sin \alpha}{S} \right]$$

$$t = \lambda + \phi$$



$$\dot{\lambda} =$$

~~$$t = \lambda + \phi = \theta$$~~

~~$$\lambda = \theta - \phi$$~~

~~$$\dot{\phi} = 0$$~~

when $\sin \alpha = \frac{v_f}{v_A} \sin \theta$

~~$$\phi =$$~~

$$F/R = 2/1 (400/200)$$

$$P_0 = .2 \quad P_R = .8$$

$$\frac{1}{4}$$

L ~~35~~-28
 LV 34-S
 PH 22-S
 PR 251-S
 89-S
 5-174

$$\frac{1}{2}$$

10-S
 124-S
 70-S
 239-S
 167-S
 5-127

$$\frac{3}{4}$$

177-S
 219-S
 146-S
 227-S
 199-S
 5-16

$$1.0$$

282-S
 282-S
 215-S
 215-S
 215-S
 215-S

NOG

$$F/R = 4/1 (800/200)$$

L 20-S
 LV 199-S
 PH 118-S
 PR 727-S
 453-S
 5-127

409-S
 523-S
 389-S
 711-S
 601-S
 429-S

660-S
 683-S
 563-S
 698-S
 652-S
 613-S

748-S
 748-S
 677-S
 677-S
 677-S
 677-S

NOG

$$1 - (1 - P_0)^{\frac{b}{ka}} \sim \left[1 - (1 - P_0)^{\frac{b}{ka}} \right]^a$$

$$\frac{dB}{dt} = \left(\frac{B}{R}\right)^{p_R} B$$

$$\frac{dR}{dt} = \left(\frac{B}{R}\right)^{p_R} R$$

$$\frac{dB}{dt} = p_R B$$

$$\frac{dR}{dt} = p_R R$$

$$\left(\frac{B}{R}\right)^{2}$$

$$\left(\frac{R}{B}\right)^{4}$$

$$\frac{a^2+1}{a}$$

$$a + \frac{1}{a}$$

$$\frac{1}{2} + 2 \frac{1}{2}$$

$$a + \frac{1}{a}$$

$$p_R R^a B^{1-a}$$

$$p_B B^a R^{1-a}$$

$$p_R R^{2a-1}$$

$$p_B B^{2a-1}$$

$$\frac{dB}{dt} = p_R \left(\frac{R}{B}\right)^{\frac{1}{a}} B$$

$$\frac{dR}{dt} = p_B \left(\frac{B}{R}\right)^a R$$

$$a + \frac{1}{a} - 1$$

$$p_R p_R$$

$$p_B B^{a+\frac{1}{a}-1}$$

$$\frac{p_R}{p_B} \frac{\left(\frac{R}{B}\right)^{\frac{1}{a}} B^{1-\frac{1}{a}}}{B^a R^{1-a}}$$

[illegible]