

EW TFP

Electronic Warfare Training For Pilots

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- What is EW TFP?
 - A number of sets of **practical** EW exercises designed to use the on board equipment effectively
- What is EW TFP not?
 - Not an in-depth **academic** course focusing on the math behind all EW

EW TFP Concept

- **EA – Electronic Attack:** focus on using own EW - equipment actively.
- **ES – Electronic Support:** focus on using own sensors passively for SA, targeting, evasion etc.
- **EP – Electronic Protection:** focus on dealing with any countermeasure used against own systems.

EW TFP Concept

- Use of the on-board EW system for the “aggressors” jammer (reprogrammable preferred...)
- Extensive use of EW-Library updates (focus on Counter Measures)
- Designing the jamming techniques in close collaboration with radar experts (industry)
- “No-blame culture”, learn from each other

First step – Electronic Protection

- Why EP?
 - Pilots already proficient in using own radar, weapons etc.
 - Only short pre-brief necessary before first flight
 - Use of EW-backseaters to adjust EW-level in flight
 - Focus on hands-on work in the cockpit
 - EP will create a base for future EA set-ups



EP – set-ups

- EP1 – 1 vs 1
 - Handle different types of jamming techniques
 - Try different radar settings, volume, range, modes
 - Effect of jamming after lock-on vs prior lock-on



EP1, 1V1 (One Ship Vs One Jammer)

Req. Set up >XX NM

Maneuvering w chaff @ XX-YY NM

Radar handling

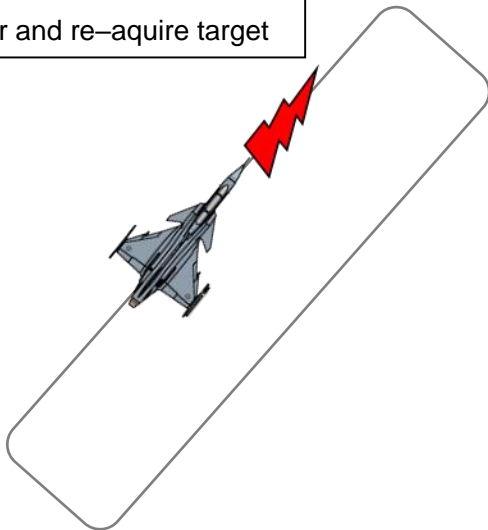
Use normal settings

@ established track – "Start No 1"

@ half way reset radar and re-acquire target

"START No 1"

#1



Jammer handling

Music On after: "Start No X"

1. – Jam techn. 1
2. – Jam techn. 2
3. – Jam techn. 3
4. – Jam techn. 4
5. – Jam techn. 5
6. – Chaff Maneuver: Z G at XX-YY NM (A/B OK)

Date:

Time:

"#2 READY IN SOUTH"

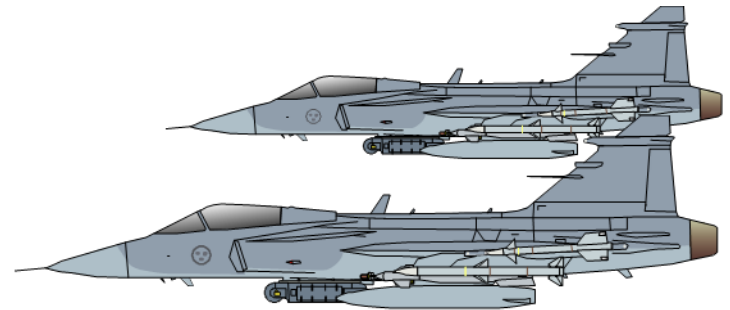
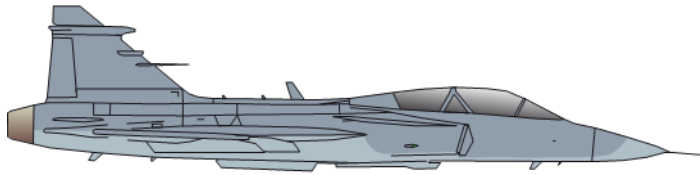
#2



EXAMPLE

EP – set-ups

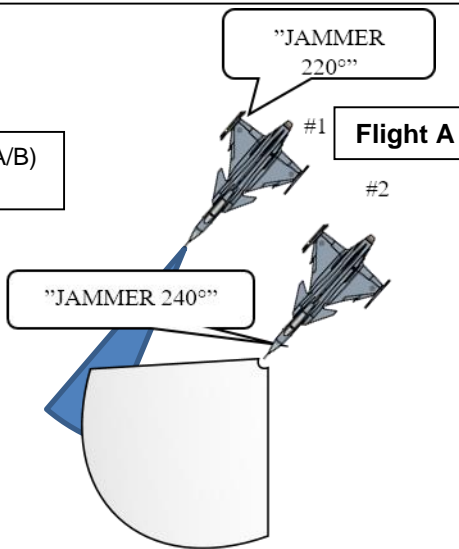
- EP1 – 1 vs 1
 - Handle different types of jamming techniques
 - Try different radar settings, volume, range, modes
 - Effect of jamming after lock-on vs prior lock-on
- EP2 – 2 vs 1
 - 2 ship Co-Op vs 1 jammer



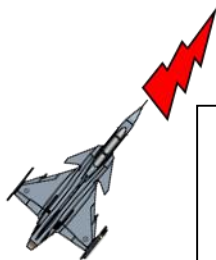
EP2, 2V1 (Two Ship Vs One Jammer)

Req. Set up >XX NM

After 3 set ups: Change Flight lead (Flight A/B) and do 4-6



EXAMPLE



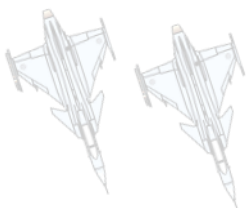
Jammer handling

Music On **before** turning Hot

1. No Maneuvering – Techn. 1
2. $\pm XX^\circ$ S-turn maneuver @ XX-YY NM
3. Chaff Maneuver with ECM @ XX-YY NM
4. No Maneuvering – Techn. 4
5.
6.

Date:

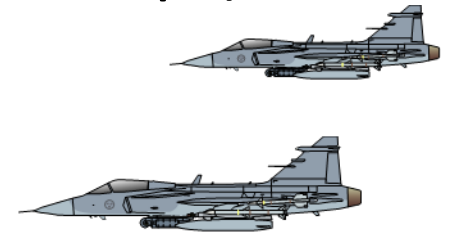
Time:



Flight B

EP – set-ups

- EP1 – 1 vs 1
 - Handle different types of jamming techniques
 - Try different radar settings, volume, range, modes
 - Effect of jamming after lock-on vs prior lock-on
- EP2 – 2 vs 1
 - 2 ship Co-Op vs 1 jammer (known set-ups)
- EP3 – 2 vs 2
 - 2 ship Co-Op vs 2 jammers (known set-ups)
 - Focus on tactical aspects



EP3, 2V2 (Two Ship Vs Two Jammer)

Set up >XX NM
Normal Speed

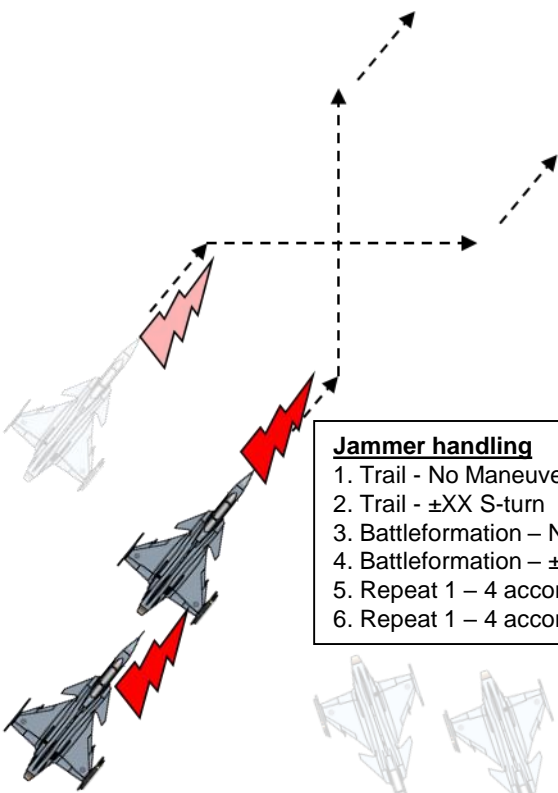
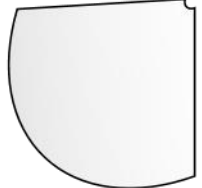
"JAMMER 220°"

#1

Flight A

#2

"JAMMER 240°"



- Jammer handling**
1. Trail - No Maneuvering
 2. Trail - $\pm XX$ S-turn maneuver @ $\sim XX$ NM
 3. Battleformation - No Maneuvering
 4. Battleformation - $\pm XX^\circ$ Cross-turn @ $\sim XX$ NM
 5. Repeat 1 - 4 according to Flight A/B
 6. Repeat 1 - 4 according to Flight A/B

Flight B

EXAMPLE

The secret sauce: Group Evaluation



Group Evaluation

- Using existing pilot know-how of own systems
- Sharing of findings and tips
- Radar- & EW-expert present (industry rep. included) to explain what happens
- Focus on tactics and how to move forward

EW TFP vs Simulator

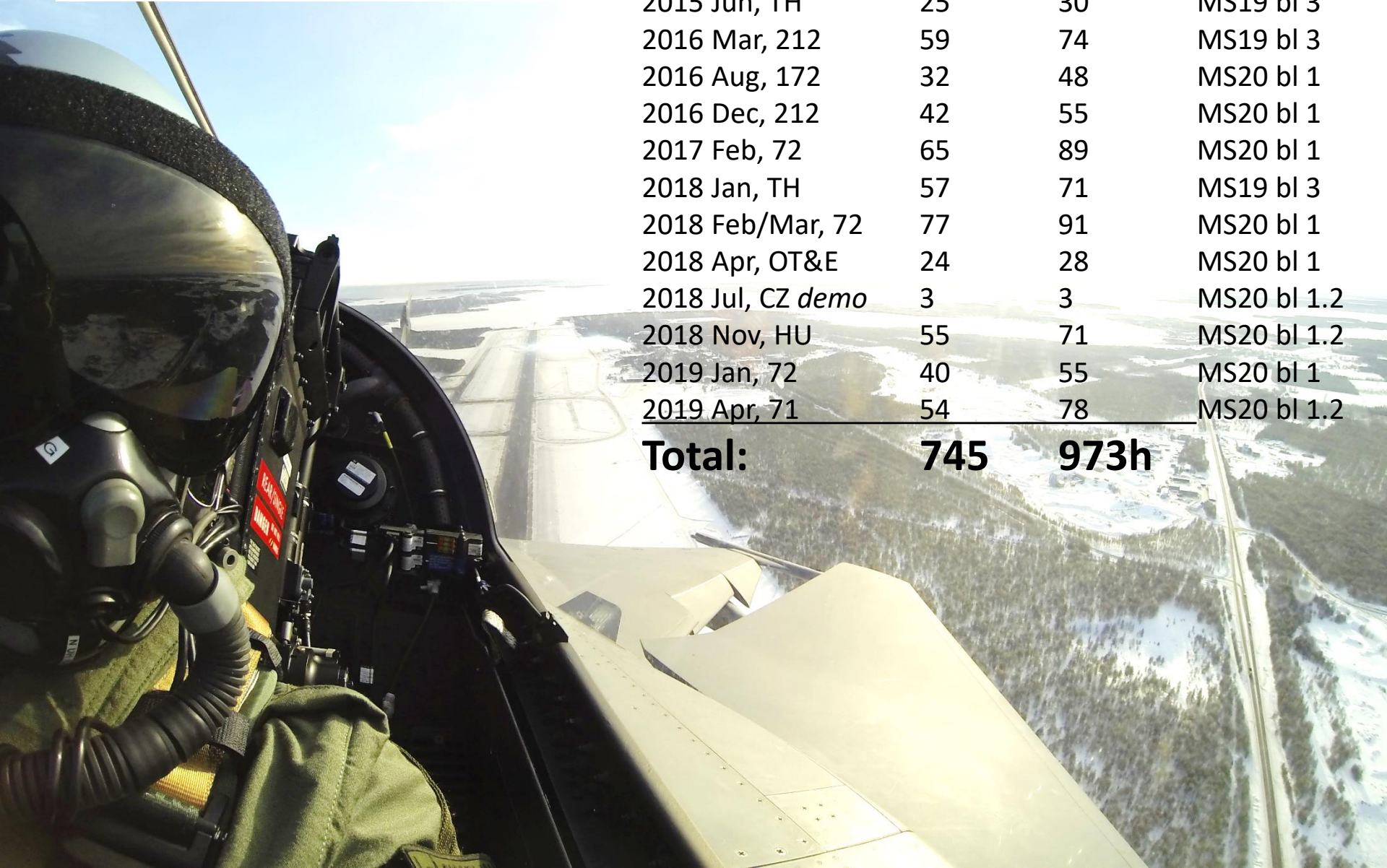
- Why not only use simulators?
 - Simulators are still limited in reproducing all the effects that influence real-life jamming (i.e. propagation, terrain, reflection etc.)
 - Simulated chaff effects limited vs real chaff effects
 - Sims **are** useful for EW training, i.e. own system handling, symbols, functions and repetitive academics etc.
 - Great potential for further EW-development

EW TFP summary

- Concepts; using EP-, EA- & ES-profiles
- Practical training in A/C
- Use of pre-knowledge (focus on hands-on training vs academics) for a tactical focus
- Adapting EW-Library to suit the training
- Backseat operators – adapting CM for each merge
- The secret sauce: detailed mass-debriefings with radar and EW specialists after each completed set-up

EW TFP in numbers,
so far....

<u>Year, Gripen sq</u>	<u>A/C flights</u>	<u>A/C hours</u>	<u>A/C version</u>
2013 Okt, TH	54	70	MS19 bl 2
2014 Nov, TH	86	110	MS19 bl 3
2015 Feb, 211	72	100	MS19 bl 3
2015 Jun, TH	25	30	MS19 bl 3
2016 Mar, 212	59	74	MS19 bl 3
2016 Aug, 172	32	48	MS20 bl 1
2016 Dec, 212	42	55	MS20 bl 1
2017 Feb, 72	65	89	MS20 bl 1
2018 Jan, TH	57	71	MS19 bl 3
2018 Feb/Mar, 72	77	91	MS20 bl 1
2018 Apr, OT&E	24	28	MS20 bl 1
2018 Jul, CZ <i>demo</i>	3	3	MS20 bl 1.2
2018 Nov, HU	55	71	MS20 bl 1.2
2019 Jan, 72	40	55	MS20 bl 1
2019 Apr, 71	54	78	MS20 bl 1.2
Total:	745	973h	



Questions?

