



# *Modern Chinese Navy and Harpoon Update*

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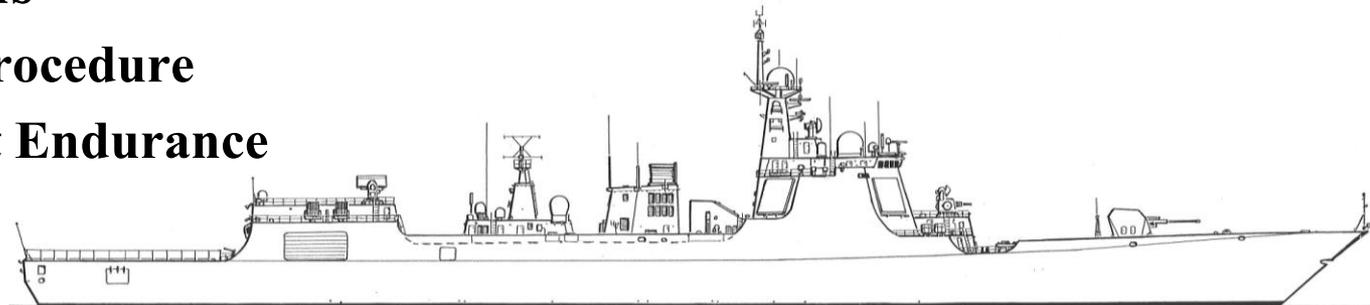
*Cold Wars 2019*

*Admiralty Trilogy Seminar*

# Outline



- ◆ **Introduction**
- ◆ **The new People's Liberation Army Navy**
  - Rapid growth in numbers and capability
- ◆ **Modern China's Maritime Forces**
  - Manfred Meyer's book
- ◆ ***Harpoon*<sup>4.2</sup> Update**
- ◆ **Room for Improvement**
  - Actionable events, not process
- ◆ **Some Solutions**
  - New AAW procedure
  - New Aircraft Endurance
- ◆ **Way Ahead**
- ◆ **Questions**



Type 052D Luyang III Mod



# Introduction

- ◆ **The People's Liberation Army Navy has undergone a profound change in force structure and capability.**
  - In the last 10 years, China has commissioned 100+ ships and submarines to include the first aircraft carrier, *Liaoning*
  - Coast Guard, Maritime Surveillance Agency, the Maritime Militia, etc have all seen significant increases in their order of battle as well
- ◆ **Understanding China's current and future maritime aspirations requires a firm basis to have an informed debate.**
- ◆ **Traditional references are on the decline and/or over priced.**
  - *Weyers Flotten Taschenbuch 2019/21* just came out (last issue 2013-2015)
  - USNI's *Combat Fleets of the World*, 16<sup>th</sup> ed still most current (2013)
  - *Flottes de Combat 2018* recently published (two new editors)
  - *Jane's Fighting Ships 2018* – very expensive, last editor resigned/quit?



# Modern China's Maritime Forces

## China's Maritime Forces

by  
Manfred Meyer



A compilation of all ships and boats of the Chinese Navy, Coast Guard and other state authorities and agencies



# Modern China's Maritime Forces

- ◆ **Author and illustrator: Manfred Meyer**
  - One of the illustrators for *Weyers Flotten Taschenbuch*
- ◆ **Edited and published by the *Admiralty Trilogy Group***
  - **Why ATG?**
    - Because no other publisher in Europe or the U.S. was interested
- ◆ **Fully integrated book with Meyer's draftsman quality illustrations (570 drawings) and order of battle data, combined with ATG's *Harpoon*<sup>4</sup> annex data.**
- ◆ **Dr. Andrew Erickson of the U.S. Naval War College's China Maritime Studies Institute wrote the foreword**
- ◆ **Available in pdf and hard copy from the Wargame Vault.**
  - The pdf version was updated in January 2019

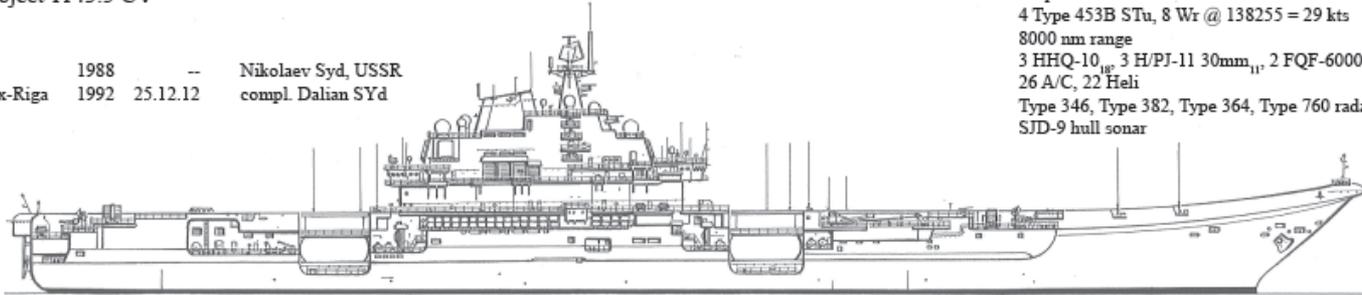


# Modern China's Maritime Forces

1 Ex-Soviet Project 1143.5 CV

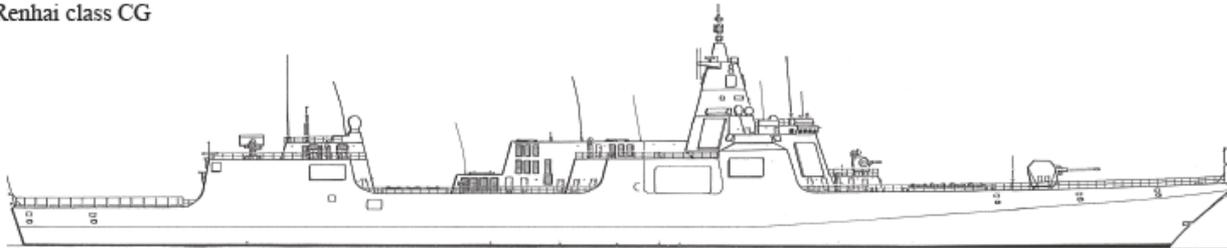
**Liaoning/16** 1988 -- Nikolaev Syd, USSR  
 ex-Varyag, ex-Riga 1992 25.12.12 compl. Dalian SYd

Displ 52000 std/60000 ft Dim 304.5 x 72 x 10.5 m Crew 2100  
 4 Type 453B STu, 8 Wr @ 138255 = 29 kts  
 8000 nm range  
 3 HHQ-10<sup>18</sup>, 3 H/PJ-11 30mm<sup>11</sup>, 2 FQF-6000 RBU<sup>12</sup>,  
 26 A/C, 22 Heli  
 Type 346, Type 382, Type 364, Type 760 radars  
 SJD-9 hull sonar



## Cruisers:

0 + 6 + 12 Type 055 Renhai class CG



**Nanchang/101** 26.06.17 Jiangnan SYd  
**Jiaxing/102** 28.04.18 Jiangnan SYd  
**Zunyi/103** under constr. Dalian SYd  
**Yan'an/104** under constr. Jiangnan SYd  
**V** 03.07.18 Dalian SYd  
**VI** 03.07.18 Dalian SYd

Displ 10300 std/12000 ft Dim 180x 20,9 x 7,2 m Crew 280  
 4 GTu QC-280 @ 71650 kW = 31 kts  
 10000 nm range  
 VLS<sup>112</sup> for HHQ-9, CJ-10, YJ-18, Yu-8, 1 HHQ-10<sup>24</sup>,  
 1 H/PJ-45A 130mm, 1 H/PJ-11 30mm<sup>13</sup>, 2 Heli  
 Type 346B X-band and S-band, nav radars  
 Unidentified hull and SJG-311 active towed array sonars

VII-XVIII

\* unconfirmed names

◆ MCMF covers *all* ships and submarines in the People's Liberation Army Navy, as well as the Coast Guard, Maritime Surveillance Agency, Maritime Safety Agency, Fisheries Protection and more.



# Type 055 Hull 1

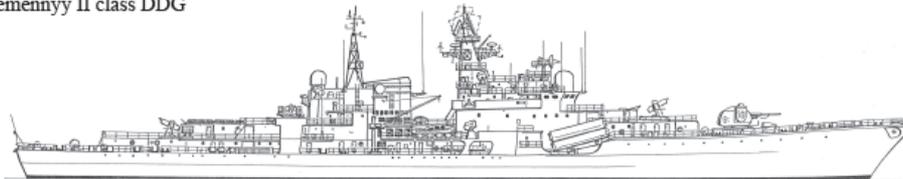




# Modern China's Maritime Forces

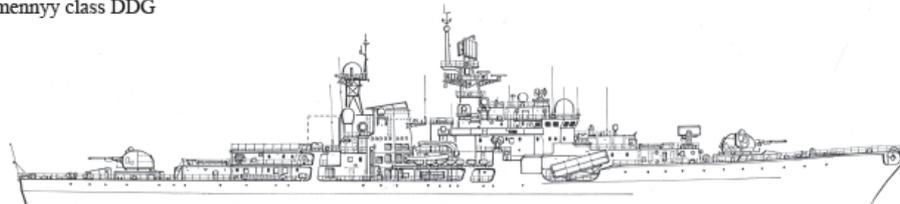
## Modern China's Maritime Forces

### 2 Soviet Project 956EM Sovremenny II class DDG



<b>Taizhou/138</b> ex-Vnushitelnyj	27.04.04	15.02.06	Severnij Verf St. Petersburg, Russ.	Displ 6500 std/7940 fl 2 DTu GTSA-674, 4 Wt KWG-3D @ 73000 kW = 32 kts 6500 nm range	Dim 156.5 x 17.2 x 6 m Crew 296	2 SS-N-22 <sub>g</sub> , 2 SA-N-7B <sub>24</sub> , 1 AK-130 130mm <sub>g</sub> , 2 RBU 1000 <sub>g</sub> , 2 Kashtan M CIWS, 2 533mm TT, 1 Heli MR-750MA Fregat M2EM, Mineral-ME, 3 MR-212 Vygach-U radars, MR-352 Positiv-ME1.2 radar, MGK-335EM hull sonar
<b>Ningbo/139</b> ex-Vechnyj	23.07.04	18.11.06	Severnij Verf St. Petersburg, Russ.			

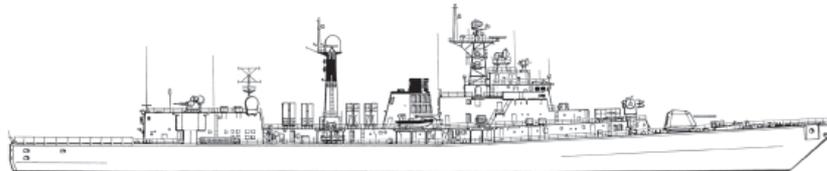
### 2 Soviet Project 956E Sovremenny class DDG



<b>Hangzhou/136</b> ex-Ekaterinburg, ex-Vazhnyj	27.04.94	11.02.00	Severnij Verf St. Petersburg, Russ.	Displ 6600 std/8440 fl 2 DTu GTSA-674, 4 Wt KWG-3D @ 73000 kW = 32 kts 6500 nm range	Dim 156.5 x 17.2 x 6 m Crew 290	2 YJ-12 <sub>g</sub> , VLS <sub>32</sub> for HHQ-16, 2 AK-130 130mm <sub>g</sub> , 4 AK-630M 30mm <sub>g</sub> , 1 HHQ-10 <sub>24</sub> , 2 324mm ASW TT, 2 RBU 1000 <sub>g</sub> , 1 Heli Type 382, Type 366, Type 364, 2 Type 760 radars, MGK-335EM hull sonar
<b>Fuzhou/137</b> ex-Aleksandr Nevskij, ex-Vdumchivij	16.04.99	16.01.01	Severnij Verf St. Petersburg, Russ.			

136 in general repair and modernisation since 2015, 137 started in 2018,  
Original armament 2 SS-N-22<sub>g</sub>, 2 SA-N-7A<sub>24</sub>, 4 AK-630 30mm<sub>g</sub>,  
2 533mm, ASW TT, 2 RBU 1000<sub>g</sub>, 1 Heli

### 2 Type 052 Mod Luhu class DD



<b>Harbin/112</b>	28.08.91	08.05.94	Hudong Zhonghua	Displ 4200 std/4800 fl 2 GTu LM2500 @ 27356 kW, 2 DM MTU 12V1163 @ 7200 kW = 30 kts (Harbin)	Dim 144 x 16 x 5.1 m Crew 270	4 YJ-83 <sub>g</sub> , 1 HHQ-7 <sub>g</sub> , 1 H/PJ-33A 100mm <sub>g</sub> , 2 H/PJ-12 30mm <sub>g</sub> , 2 324mm ASW TT, 2 FQF-3200 RBU <sub>g</sub> , 2 Heli Type 517B, Type 364, Type 360, 2 Type 760 SJD-7 hull and SJG-206 passive towed array sonars
<b>Qingdao/113</b>	18.10.93	28.05.96	Hudong Zhonghua	2 GTu AM-50 @ 23825 kW, 2 DM MTU 12V1163 @ 7200 kW = 30 kts (Qingdao) 4000 nm range		



# Future China Supplement

- ◆ A *Harpoon*<sup>4</sup> Chinese navy supplement is slated for production after the U.S. and Soviet/Russia navy books are completed
  - Complete coverage of the PLAN and applicable portions of PLA and PLAAF
  - Will replace *Sea of Dragons*



Type 093A Shang SSN



Type 052D and 052D Mod Luyang III DDG



# *Harpoon*<sup>4</sup> Update

## ◆ Background

- First edition (*Harpoon*) - Adventure Games, 1980
- Second edition (*Harpoon II*) - Adventure Games, 1984
- Third Edition (*Harpoon III*) - GDW, 1986
- Fourth Edition, *Harpoon*<sup>4</sup> - Clash of Arms, 1996
- *Harpoon*<sup>4.1</sup> - Clash of Arms, 2001

## ◆ *Harpoon* system is complete, but there is always room for improvements.

- And it's been 18 years, so we're putting *Harpoon* in for overhaul



# *Harpoon*<sup>4</sup> Improvements

- ◆ **New ships, aircraft, systems, and technology need to be added**
  - Unmanned vehicles
  - Mine warfare
  - Ballistic missiles and ship-based defenses to counter them
- ◆ **Increased access to information lets us model system interactions more accurately and address issues missing from earlier editions**
  - Naval War College archive documents provided a wealth of data
- ◆ **Complex process-oriented rules need to be simplified**
  - Focus on actionable events rather than detailed processes, e.g.
    - Anti-air warfare
    - Aircraft endurance
- ◆ **Changing tastes and expectations**
  - Speed of play now more desirable than greater detail



# Modeling Formation Air Defense

- ◆ **Few, if any decisions**
  - Select targets, fire, wait, and repeat
- ◆ **Complex interactions of ship/formation defenses and attackers**
  - Multiple shooters engaging multiple targets
- ◆ **Many moving parts, all being done manually**
  - Missiles measured and moved each Engagement Turn
  - Individual engagements
  - Lots of time consuming process

*Missile attacks often represent the climax of the game, yet action slows to a crawl.*





# Modeling Formation Air Defense

- ◆ **Use standard three minute Tactical Turn for movement**
- ◆ **Fire phases and Detection phase merged into six Engagement Impulses**
  - **Roll once to see when a ship detects the incoming missiles**
- ◆ **Surface to air missiles engagements use a loose nodal approach**
  - **Exact location of SAMs not required**
  - **SAM system has a number of engagements – actionable events**
- ◆ **Anti-ship missile lock-on occurs after SAM engagements**
  - **Soft kill defenses applied**
- ◆ **Point defenses take their shot**
- ◆ **Surviving missiles hits the target ship**
- ◆ **Goal is to reduce the number of units/pieces to be handled**



# New Air Defense Model

**Combat System  
Generation gives reaction  
time and kill assessment**

**Engagement is constrained  
by reaction time or SAM  
max range.**

<b>ASCM Type:</b>	Kh-22N		<b>SAM Type:</b>	SM2MR Blk IIIA			
<b>ASCM Spd:</b>	2003	kts	<b>SAM Max Rh:</b>	90	NM		
<b>ASCM Alt:</b>	High		<b>SAM Min Rh:</b>	3	NM		
			<b>SAM Speed:</b>	2006	kts		
<b>CDS Gen</b>	5		<b>Engagement</b>		<b>Time (sec)</b>	<b>Impulse</b>	<b>Range (NM)</b>
<b>React Time</b>	15	Sec	1		116	4	64.6
<b>Kill Assess</b>	5	Sec	2		177	6	31.2
			3		207	7	13.9
<b>Initial Det Rh:</b>	137.0	NM	4		222	7	5.6
<b>Est Track:</b>	128.7	NM	5				6.2%
<b>Engage Start:</b>	128.7	NM	6				
			7				
			8				
<b>Remarks:</b>	Reaction time is the constraining factor on maximum engagement range.						
	Target is a Med Supersonic missile. Detecting radar is a SPY-1B vs a Small target.						
<b>ASCM Type:</b>	P-35		<b>SAM Type:</b>	SM2MR Blk IIIA			
<b>ASCM Spd:</b>	910	kts	<b>SAM Max Rh:</b>	90	NM		
<b>ASCM Alt:</b>	High		<b>SAM Min Rh:</b>	3	NM		
			<b>SAM Speed:</b>	2006	kts		
<b>CDS Gen</b>	5		<b>Engagement</b>		<b>Time (sec)</b>	<b>Impulse</b>	<b>Range (NM)</b>
<b>React Time</b>	15	Sec	1		161	5	89.7
<b>Kill Assess</b>	5	Sec	2		275	9	60.7
			3		354	12	41.2
<b>Initial Det Rh:</b>	137.0	NM	4		408	14	27.3
<b>Est Track:</b>	133.2	NM	5		445	15	17.8
<b>Engage Start:</b>	130.0	NM	6		471	16	11.7
			7		488	16	6.7
			8		500	17	3.9
<b>Remarks:</b>	SAM max range is the constraining factor on maximum engagement range.						
	Target is a Low Supersonic missile. Detecting radar is a SPY-1B vs a Small target.						



# New Air Defense Model

New model combines missile kinematics with combat system capabilities to define the number of engagements a SAM has by range bands

In some situations, a SAM system will have zero engagements opportunities

SAM Type:		RIM-7M	CDS Gen: 4			
			Engagements per msle range bin			
Tgt Spd	Tgt Alt		1/3	1/3 - 2/3	>2/3	Total
Med Supersonic	High		1	--	1	2
Low Supersonic	High		1	1	1	3
Low Supersonic	Vlow		--	1	1	2
Transonic	Med		1	1	1	3
Transonic	Vlow		1	1	1	3
SAM Type:		SM1MR Blk VI	CDS Gen: 4			
			Engagements per msle range bin			
Tgt Spd	Tgt Alt		1/3	1/3 - 2/3	>2/3	Total
Med Supersonic	High		1	--	1	2
Low Supersonic	High		2	1	1	4
Low Supersonic	Vlow		1	1	--	2
Transonic	Med		2	1	2	5
Transonic	Vlow		2	1	--	3
SAM Type:		SM1ER Blk II/III	CDS Gen: 3			
			Engagements per msle range bin			
Tgt Spd	Tgt Alt		1/3	1/3 - 2/3	>2/3	Total
Med Supersonic	High		1	--	1	2
Low Supersonic	High		1	1	1	3
Low Supersonic	Vlow		--	--	--	0
Transonic	Med		2	2	--	4
Transonic	Vlow		1	--	--	1
SAM Type:		SM2MR Blk II	CDS Gen: 4			
			Engagements per msle range bin			
Tgt Spd	Tgt Alt		1/3	1/3 - 2/3	>2/3	Total
Med Supersonic	High		1	1	1	3
Low Supersonic	High		3	1	2	6
Low Supersonic	Vlow		2	--	--	2
Transonic	Med		4	2	--	6
Transonic	Vlow		4	--	--	4
SAM Type:		SM2MR Blk IIIA	CDS Gen: 5			
			Engagements per msle range bin			
Tgt Spd	Tgt Alt		1/3	1/3 - 2/3	>2/3	Total
Med Supersonic	High		2	1	1	4
Low Supersonic	High		5	1	2	8
Low Supersonic	Vlow		3	--	--	3
Transonic	Med		6	1	--	7
Transonic	Vlow		5	--	--	5



# New Air Defense Model

## ◆ **Combat Direction System Generations**

- **Looking at seven generations of combat systems**
  - **Driven by computer processing power**
  - **Six pertain to fleet air defense, the seventh is BMD oriented**
- **The U.S. Navy NTDS system is Generation 3, updates are Generation 4**
- **Aegis is largely Generation 5-7 (Baseline 0 and 1 are Gen 4+)**
- **Each generation has a reaction time and kill assessment time defined**
  - **Reaction time is the time from initial detection to firm track**
  - **Kill assessment is the amount of time to determine if a target was hit**
  - **Example: Gen 3 has a 90 second reaction time and 15 second kill assessment**

◆ **Naval War College data indicated *Harpoon*<sup>4</sup> SAM ATA values were too high – values dropped, on average by about 3.**

◆ **Firing doctrine now makes a lot more sense**

- **Shoot-Shoot-Look is far more the norm than Shoot-Look**



# New Air Defense Model

- ◆ **An engagement opportunity is where the defending player rolls their dice**
  - Engagements = # of directors x fire control or target channels
  - Missile launcher rate of fire can impose some limitations
- ◆ ***Example: U.S.S. Dale, CG-19 is equipped with:***
  - Gen 3 Combat system and two Mk10 launcher
    - ROF = 2msles per launcher per impulse
  - Four SPG-55 directors/illuminators with 1 target channel each
  - Four targets with a two missile salvo per engagement opportunity
- ◆ **Missile combat table has only been slightly modified, big changes are in:**
  - Missile ATA values, target ATA values and modifiers
    - Now eight speed regimes from Subsonic to High Hypersonic
    - SAM ATA values are now also range dependent



# Aegis Example

## ◆ U.S. Burke class Aegis destroyer

- Generation 5 Combat System
- 2 Mk41 vertical launchers
  - 15 missiles per launcher per impulse
- Three SPG-62 illuminators with 4 target channels each

## ◆ Against a high flying, Med supersonic missile

- 4 engagement opportunities
  - Long – 1, Med -1, Short – 2
- 12 channels total
- Launcher ROF sufficient
- *12 attacks with two missile salvos per engagement*





# Aircraft Endurance

- ◆ **Current rules have a full-featured, detailed fuel consumption model with a rather length calculation.**
- ◆ **Endurance is affected by:**
  - **Altitude (Low vs, Med/High/VHigh)**
  - **Throttle Setting (Cruise, Full Military, Reheat)**
  - **Engine Type (Piston, TJ, TP, TS)**
  - **Payload (Clean, Light, Full)**
  - **Airborne tankers**
- ◆ **This math is done before each mission, and where possible before game start, but process is still hard to follow.**



# Simplified Aircraft Endurance Model

- ◆ **Eliminate the ordnance reduction for range. Listed ranges will include reductions for ordnance, takeoff, forming up etc.**
- ◆ **The payload calculation also uses the engine type, so that goes away as well.**
- ◆ **We don't need to worry about specific range calculation for afterburner, since it's only used in combat for short times.**
- ◆ **Thus, figuring the range now becomes:**
  - **Cruise range + drop tank range add**
  - **Range penalties for flying at Low altitude, FMP, and Reheat.**



# Really Simplified Inflight Refueling

~~The current process requires converting kg/nm to the refueling a/c to kg/nm for the receiving a/c (Bad!)~~

- ◆ The process will now be based on “top-down” abstraction.

	<u>Large</u>	<u>Medium</u>	<u>Small</u>
Large tanker can refuel:	One	Two	Four
Medium tanker can refuel:	--	One	Three
Small tanker can refuel:	--	--	Two

- ◆ That’s it. Rules will limit tanker placement and the actual refueling process. But this is a process.

*Refueling is a non-combat evolution*



# The Way Ahead

- ◆ **Play testing will go on throughout the summer.**
- ◆ **Planned release date: Late summer.**
- ◆ **Initial Release:**
  - *Harpoon<sup>4.2</sup> rules, Player's Handbook, Quickstart*
  - *America's Navy, Vol. 1 Ships, Vol. 2 Aircraft*
  - *Russia's Navy, Vol. 1 Ships, Vol. 2 Aircraft*
  - **The Navies series, Like the Fleet series, will provide annexes for the *Harpoon* era (1955 - present day)**
- ◆ **Planned future releases include:**
  - **PRC, Japan, Western Europe, Eastern Europe, Persian Gulf**
- ◆ **Scenario supplements, such as *Troubled Waters 2<sup>nd</sup> ed*, will be published as well.**



# Questions?

