MIG ALLEY: QUESTIONS AND ANSWERS

February 1998

1   The Game

When was the idea for this simulation born, and why this period of history?

The research started in 1995 and the team really got involved at the beginning of 1997 when Flying Corps was finished. 3d card support and the mission editor distracted us a little last year. This year we are focused on MiG Alley.

There are a number of good reasons to choose the Korean conflict:

- The Somme is flat and so people think that our landscape engine is flat. It's not and our Korean sim will prove it! In Korea we have mountains in excess of 8000ft with bridges over ravines. Ideal stuff for exciting flying.

- The Front moved rapidly and so we can have an interesting dynamic campaign based on reality. The player will have an effect on the ground war. When on ground work, the player will have napalm and rockets as well as guns and bombs.

- The conflict had the first jet vs jet combat. There was some jet vs prop stuff as well. We will simulate conflicts where there are over a hundred aircraft from each side in the air at the same time.

- Even though the player will be flying jets most of the time, he will still have to concentrate on getting close to fight. There is no air to air radar and no missiles so we will still be able to avoid "shooting at dots".

Compared with Flying Corps we have some new stuff:
- play campaigns over the Internet
- voice-based radio chatter with the option of giving orders
- gun camera film
- accurate gun-sight simulation
- configurable quick start missions

How will you make the sim accessible to the novice? Will we be able to select levels of realism in flight, avionics, enemy AI?

The quick start missions allow easy access. The mini-campaign gradually introduces the player to the complexities of the game. Even in the Spring Offensive, default missions are provided. However the player can change as much or as little as he wants.

Just like FC there will be many levels of realism.

2　The Game Engine

MiG Alley uses a new Rowan engine:

- MiG Alley will be our first Windows only flight sim. The user interface is based on MFC.
- The landscape engine has been rewritten to allow us to simulate a larger area: 1500km by 1000km. In FC we had two 150km by 150km areas.
- The flight model has been completely rewritten to allow a more accurate calculation of forces and moments. More details are included, e.g.:
    - effect of damage
    - suspension on the ground
    - speeds around mach 1 are simulated
- The campaign engine, including a complex supply network, is completely new.
- Cockpit instrumentation and weaponry is modelled on virtual cockpits.

3　The Campaigns

One cutting edge of sim design is dynamic campaigns. Flying Corps gave us a semi-dynamic system, will MiG Alley do the same?

We are aiming for a near-total dynamic system.

Tell us about the campaigns.

We have covered the start of the conflict in 1950 with a sequence of small contained mini-campaigns. The face of the war changed constantly throughout this year and we felt that approaching each key turning point as a separate campaign was the way to go. With each mini-campaign, the History of the Korean War is related and the player is introduced to a new aircraft, new aspects of mission planning and new tasks like Close Air Support and MigCap.

The mini-campaigns cover such moments as the North Korean's initial shock invasion of the South, the UN's desperate defence at the Pusan perimeter until the Inchon landing, the Chinese Intervention and UN retreat from North Korea, and the appearance of MiGs in MiG Alley.

Moving onto 1951, we have the Spring Offensive, the main Campaign that covers the period from January to July when the Reds are preparing for their big offensive. UN ground forces have managed to stabilise a front line and the war could now go either way. During this campaign, the player takes on the role of the Supreme Air Commander who must manage the entire UN air effort in support of the ground forces. This covers the whole country and every aspect of the conflict. Each day, targets must be selected and aircraft allocated. A mission can be planned in detail or set-up automatically. The player is then free to fly in any squadron, taking on any level of responsibility.

By '52, the war turned into a bloody stalemate with both sides trying to gain advantageous positions before the end of the peace talks. During this period, the player is given the chance to fly special 'Gold' missions, an example being an attack on a Hydro-Electric dam.

Will MiG Alley include a Mission Planner?

The campaigns revolve around the map screen which is essentially a Mission Planner. In addition to the campaigns there is a configurable quick start option. It should take only a few seconds to set up a mission.

When the player enters a campaign will he start out as a wing leader, or will he have to complete some training first?

In the Mini-Campaigns that introduce the Spring Offensive, the player will have to get promoted to leader. In the Spring Offensive he is in overall charge and can fly in any position.

Will resource management be a necessity in MiG Alley?. What does this look like? Will it include pilot resources also?

The player doesn't have to manage every aspect of his resources. The computer will set up a reasonable set of default missions each day. However if the player wants to develop his own strategy he will have to manage about 80 aircraft and a similar number of pilots. Each aircraft can do up to two combat missions per day.

We will have squadron management that expands greatly on that seen in Flying Corps. The pilots will have more character traits than before, like leadership ability, formation keeping and support. The player will have to mix the right pilots together to get an effective flight or team.

4   The Graphics

The graphics engine for Flying Corps eventually became state of the art. What are some of the key features for MiG Alley? Will we see light source shading, dynamic lighting, blast effects? Are there any surprises?

Any forthcoming suprises won't be revealed until you play the game! There will be light source shading for 3d cards, which should look particularly spectacular at night. Smoke and explosion effects are much more realistic than in Flying Corps and will set new standards. In addition to that we have lens flare, napalm, very long contrails and much more...

The terrain modelled in Flying Corps was basically flat, where Korea is mountainous. How will this affect both the look of the sim and the tactics of gameplay?

The Somme is very flat but the Verdun area (Hat in the Ring) does have an altitude range of 1500feet. Have you noticed on the User Group that some people think the Somme is hilly and we didn't simulate it correctly! It made me smile. Korea is hilly and we should have done it first so that people could see that the engine could cope! Seriously, one of the reasons that we have

left Korea for so long has been that we have been waiting for the hardware to be fast enough.

What will be the maximum resolution? Is there proprietary support for 3d chipsets?

Maximum resolution will be hardware dependent. We support Direct 3d however, so far, experience has shown that we still need to tweak the code for each new card.

Will we also see weather modelling?

Rain and floods should be present.....

5   The Aircraft

What are the flyable aircraft in MiG Alley, and why were they chosen?

In MiG Alley you will be able to fly the following aircraft:

- North American F86 Sabre versions A, E and F
- Mikoyan Gurevich MIG 15 and MIG15bis
- Republic F84 E Thunder Jet
- Lockheed F80 C Shooting Star
- North American F51 D Mustang
- North American F82 G Twin Mustang

The F86 is the fighter. The majority of the most notable air battles in MiG Alley were between Sabres and MiG 15s. The F80 and F84 took the fighter bomber role which included some ground support. The F51 was involved in ground support and truck and train interdiction.

This is a representation set of the fighter aircraft flown during the conflict. If we attempt to simulate too many then we cannot do individual aircraft justice. However we do need a range of aircraft to give the player a feel for asset-management. In the campaign, the player can choose his strategy to win the war. He will have to manage his assets sensibly.

What other aircraft will we see?

T-6	for Forward air controllers, complete with smoke rockets to show you where to place your ordnance
YAK-9	
Il-10	
Il-28	
B29	
B26	
C54	
C47	
Po2	

Meteor
Corsair
YAK-15
Sikorsky HO2S-1

6   The Flight Model

Flight modelling in Flying Corps was excellent! It sounds like the goals for MiG Alley are even more ambitious! Tell us about the modelling.

The aircraft in MiG Alley are capable of realistically simulating many characteristics such as flick rolls, spins, aileron reversal, adverse yaw, slipstreaming, stalling etc. Many aerodynamic and inertial effects such as aeroelasticity, wing sweepback, dynamic coupling, compressibility are modelled. Real life aerodynamic data has been used to correctly couple all six degrees of freedom. In each case the characteristics of the aircraft have been carefully adjusted to reproduce real life performance.

With respect to the MiG Alley software the job of the flight model is to receive player inputs, then output aircraft position, velocity, feedback and instrumentation data. The model is executed every 30 milliseconds, independently of the display frame rate. Within each execution the following processes occur:

- Receive player inputs
- Obtain ambient atmospheric conditions including wind and gust vectors
- Perform propulsion calcs (thrust, engine speed, reaction torque)
- Calculate aerodynamic forces and moments
- Calculate inertial moments (caused by aircraft rotating, mass distribution, gyroscopic effects)
- Integrate to get new velocity and position
- Calculate instrument parameters

On the ground, undercarriage tyre and leg suspension forces are modelled to make the aircraft's attitude, speed and position respond realistically to terrain geometry, engine thrust, player brake, steering and control surface inputs. You will observe the aircraft in MiG Alley tilting in response to acceleration, braking, turning and even wind gusts. In MiG Alley, if you taxi too fast and turn hard you will find you lose control as the aircraft skids.

Propulsion has two modes of operation. You can control the engines throttle setting, as a real pilot does. Or, you may simply control the engines thrust output. For prop aircraft, blade element theory is used to determine thrust/braking and reaction torque produced by the propeller. Engine reaction torque is passed to the airframe.

Atmospheric conditions vary from day to day in MiG Alley. Obviously pressure and temperature change with height. Wind and gusts are modelled three dimensionally. All these effects are included in the aerodynamics and

propulsion calculations. Try landing a shot up Sabre on a dodgy airfield in a heavy, gusty crosswind without skidding down the runway sideways.

Flight Dynamics

Performance

One of the major development objectives of the flight model was to achieve a high degree of accuracy in the performances of the MiG 15 and Sabre aircraft. A key feature of this objective was to ensure that the relative performances were true to life. Reports produced by pilots actually involved in the conflict and flight test / wind tunnel reports released by NACA (National Advisory Committee for Aeronautics) have been analysed and incorporated into the model. The data obtained, from our sources, has enabled us to achieve a superior level of accuracy. Some of the conclusions related to the relative performance of the MiG 15 and Sabre:

- Generally the MiG 15 can outclimb and accelerate away from the Sabre.
- Above 30,000 ft the MiG 15 is faster than the Sabre.
- The MiG's ceiling is estimated to be 5,000 ft higher than the Sabre's.
- Below 30,000 ft the Sabre can out turn the MiG 15 in level and diving turns.
- The Sabre can out perform the MiG 15 in a sustained dive.
- Below 20,000 ft each aircraft's level top speed are similar.

Other flyable aircraft (at present) are the Thunderjet (F84E), Shooting Star (F80C) and the Mustang (F51D). Note, three Sabres are modelled (F86A, E, F) and two MiG 15s (original and the bis). The model can accurately simulate these aircraft as well, but, compared to the Sabre and MiG, less effort has been made in fine tuning all the hundreds of parameters.

The model has been designed and developed to reproduce key combat performance characteristics for each aircraft. These fall into two major categories, manoeuvrability and agility. Manoeuvrability (or energy manoeuvrability) basically is the aircraft's ability to change the orientation of its velocity vector and its energy state, that is, to turn, accelerate or climb. Agility, however, can be defined as the ability of the aircraft to change its orientation, that is, roll and pitch performance (mostly roll and pitch acceleration). Key aspects of the aircraft's combat performance that have been reproduced in the models, are:

- Maximum Speed - Altitude curve
- Thrust - Altitude - Speed profile
- Instantaneous Turn Performance
- Sustained Turn Performance
- Climb Performance
- Acceleration Performance
- Roll and Pitch Performance

The MiG 15 was light, powerful and beautiful. When flown by an aggressive and skilled pilot it was a formidable enemy, even for the Sabre. Eliminating pilot skills, from the equation, which one do think was the "best"? Why not play MiG Alley and find out!

Weight and Inertial Moments

The magnitude and distribution of a fighter's weight has an enormous impact on the aircraft's overall performance, both in manoeuvrability and agility. Obviously the lighter an aircraft is, the better its performance will be. Aircraft with high moments of inertia about the longitudinal axis will generally have poorer roll acceleration. Likewise for pitch and the lateral axis. Wing tanks and stores will reduce agility and manoeuvrability, particularly roll acceleration.

Have you had any Sabre veterans fly the model?

In March 97 we visited Mark Hannah of the Old Flying Machine Company at Duxford Aerodrome. He flies a range of old jets and prop aircraft including the F86 Sabre and MiG 15. He gave us some tips including some unusual handling characteristics in steep turns. We hope that he will be able to fly the model this year. However he is very busy during the Summer and that is when we would need him! We are actively looking for "test pilots".

7   The AI

What can we expect to see in terms of AI opponents, both in the air and on the ground?

The Air Combat Manoeuvre (ACM) code is being completely rewritten for MiG Alley. Although the pilots still don't have missiles there are substantial differences between WW1 and Jet combat. On the other hand, many of the lessons learnt during WW1 still apply.

In the air, team work is the most important thing. The Americans were the masters of mutual support. This is why they managed to take such a toll of the numerically superior MiGs which were slow in adopting such tactics. Well, that is what they told us in *Top Gun*. However information coming out of Russia now does not completely support this conclusion. As usual the truth is more complicated than the legend. The range of skill, training and level of aggression was vast on the communist side. An American pilot didn't know what kind of opponent he had until combat was joined.

In MiG Alley, the player must learn how to work closely with his fellow pilots. Teamwork ensures survival.

How much control will the wing leader have over his team when in action, both for single player and multiplayer modes?

Before takeoff, the player can define how he wants the aircraft to support each other in the air, rendezvous areas etc...

This is the first game in which we will implement a menu of detailed radio chatter. This gives the player total control, allowing him to select how and when his team engages the enemy or breaks.

The radio menu can also be used to summon aid from other aircraft in the area and request information from various ground and base controllers.

An example of the detail is when an aircraft is hit and the pilot is uncertain of the amount of damage to his aircraft. He may request that you look his aircraft over. Via the menu you can tell him which parts of his aircraft have visible damage.

How much integration of the ground war will we see?

We have active battle areas. Troops march to positions using the safest avenue of approach, then attack or defend them. Armour and artillery are featured. Troops will react to the presence of UN aircraft. Communist troops may try to hide or scatter for protection. CAS will be exciting. The battle area can become very confusing and the player will never be quite certain if he is attacking a UN or Communist held position. Luckily, Mosquito liaison aircraft patrol the front line and these will direct the attack aircraft onto profitable targets and help avoid friendly fire incidents. Ground teams also talk pilots down onto targets via the radio.

Describe the AI implementation for ground units.

We are putting a lot of effort in this area and so we would like to say more about it in about a month's time.

How will intelligence rules and fog of war be modelled?

Limited Reconn was available during the conflict and Intelligence suffered as a result. The Reds would protect targets from continued attacks by making them appear to be more damaged than they were. The player cannot trust his intelligence all of the time.

Will the player have an impact on the enemy campaign by taking out supply convoys?

Definitely. This forms a large part of the game. A great deal of UN air effort was dedicated to stopping the flow of supplies to the front line by hitting bridges, trucks, trains, depots etc...

We have created logic for a supply network that emulates the tactics of the brilliant Chinese logistics planners. Supplies are constantly re-routed to avoid choke points, and hidden from the attention of UN pilots. The player will have to keep pace with the constantly evolving tactics of the Logistics planners. During research, we were astounded to learn of some of the more bizarre methods used in the protection of supplies and these will definitely be featured in MiG Alley. Prepare to be amazed!

8   The Weaponry

What weapons will be available to the F86 pilot?

The F86 is primarily a fighter and the only aircraft capable of matching the MiG, so generally it will carry no external weapons and will rely on its 6 internal machine guns. The F86 could be fitted with rockets for ground attack work but an F80 or 84 would be better employed in this role. They can haul an assortment of bombs and rockets and napalm.

The MiG had cannon and machine gun. The cannon packs a punch but it is slow and it's difficult to get another fighter in your sights if he is aware of you. One hit from a MiG was generally enough to down a Sabre. On the other hand, the guns on the F86 were much lighter and faster. In a turning fight it was easier to get your opponent in your sights. However you needed to land many hits to guarantee a kill.

The watchword for the sims of 1998 has to be "detail." What can we expect to see in weapons and avionics detailing in MiG Alley?

The weapons are modelled on the real weapons used:
> rockets
> machine guns
> cannons
> bombs
> napalm

Film footage has been studied in an attempt to get realistic effects. We will also be simulating the weapon and instrument panels in the cockpit. This includes weapon selection, damage indication and the gun-sight. You will be able to dial in the wingspan to set the gun-sight up correctly.

Damage modelling is another growth area in sim design. What will we see in MiG Alley in this department? Is it possible to collapse the gear of the Sabre or blow a tire, and will we ever climb in the cockpit only to find an instrument failure?

Part of the game is asset management, however we will tell the player which aircraft are unavailable. It would be too frustrating to wait for the 3d session to be set up only to be told that your aircraft is useless. After all this is supposed to be a game!

Damage can be much more specific in MiG Alley. For instance, wings can be damaged in different places and to different degrees: in damaging a wing, you could cause damage to the gear or weapons. It is possible to collapse the gear or totally rip it off.

We haven't decided about tyre blow out yet. However, I think, they were frequent occurrences during the conflict.

Damage will be indicated in the cockpit in a realistic way. For instance, low oil pressure if the engine has taken hits.

9 The View System

Will MiG Alley include a virtual cockpit? What about fixed views?

Fixed views will be locked positions of the virtual cockpit. A 6 o'clock view will be available but it won't be an owl head view.

We prefer to avoid the old fashioned bit-mapped cockpits because they tend to limit the number of screen resolutions that the player can use.

The auto internal/external padlock switching in Flying Corps was innovative and is well liked by many players. How is the padlock modelled in MiG Alley?

The aircraft in MiG Alley only have guns and so they have to get close. At this stage then we are planning to use the same system as used in FCG. However this is one of those areas that get changed at the end of a project when we can tune the dogfighting.

In MiG Alley the padlocked cockpit view will probably be the same as the fixed views. In Flying Corps the padlock view simulated the pilots sitting up and forward and so it was different from the fixed view.

10 Multiplayer

What about multiplayer support? How many players will be able to connect in one mission on the internet? Will there be a "capture the flag" option as well as coop missions? Will multiplayer campaign mode be available?

Flying Corps Gold comms allowed death match and team play on a limited number of missions for up to eight players. The following extra features are required for MiG Alley:

> campaign option
>
> user defined missions
>
> more reliable Internet play
>
> co-operative play
>
> saving sessions

Death match and team play on a limited number of missions should also be available.

We are producing a design which will incorporate all the above extra features. Full campaign Internet play will be available on the first published version. Network, Wireplay, modem and direct connect will be handled by the Internet design.

The design will not require a separate server however we will design so that the aggregator can be on a different machine from the host.

Players will be able to play the Internet game for the cost of their telephone charges. We will be using the proposed EI Lobby service for the initial Internet connection.

11 Resources

We have the following archive material that could be used for PR:

- Laser Disk from the Smithsonian which contains thousands of stills from the conflict. Each still costs about £25 each to use.
- Three hours of archive film footage which, we think, is royalty free.
- A few satellite negatives of Korea (we are not using these in the game)
- Aeronautical maps

In addition we have many books which contain photos etc. that could be used.

At present we have the following images from the game:

- a few pieces of background artwork
- some animations
- preliminary cockpit artwork
- all the shapes that will be included in the game

It is still too early to provide finished background artwork and landscape screen shots.

12 The Team

Who is involved?

Game Design	Rod Hyde
	Mark Shaw
Lead Programmer	Jim Taylor
Lead 3d programmer	Paul Dunscombe
3d programmer	Robert Slater
UI	Dallas Morrison
Comms	Andrew McMaster
Flight model	Andrew McRae
ACM	Rod Hyde
	Andrew McRae
Lead Artist	Andrew McCann
Artists	Toks Solarin
	Richard Jones
Landscape Data Prep	Amanda McCann
	Chris Jones
	Ian Hardy

Musician	Paul Robotham
Sound Effects	Sounds Appealing
Research	Ben Wilkins
Producer	Mark Havens
Network, hardware, support	Dave Whiteside