…Contact!

May 2021

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President's Column

David Toma

Just when you thought you have had it and you start questioning everything including the dreaded why questions, we end up have a weekend like our Convention weekend and it all comes back to you! Now I can only speak from my perspective, but what a fantastic weekend spent with like minded people and many a beautiful aircraft. I wanted to thank all involved who made the Convention happen, especially all the volunteers who made themselves available. I decided to take the family mover rather than the beloved Pacer, but in her defence the Pacer can't take 11 people with all their camping gear for the weekend. Earlier on that Friday morning I did attempt to bring another Pacer that I am assisting the owner with, but she is unfortunately plagued with some overheating and radio issues and I turned back. This meant that the Bonnie would have to do for the dawn patrols and she surprised us all when she seemed more than happy to ride along with the Super Decathlon and C140! Unfortunately I was surprised to see how low the attendance of the seminars was, but I am glad to report that very good discussions were had and would like to thank the presenters for their effort and time.

Please share your pictures, write your articles about your trip to the Convention as we would all love to hear from you and get our latest presentation sorted for the next chapter meetings.

In other news, it is now official, I have added another homebuilt to my collection. This one flies which meant, that unlike my other toys, she decided to give me sports on my first flight out with her, but that is a story for another article.

As always Fly Safe, Fly Lots, Fly for the love of Flying and let's get those projects in the air!

David B. S. Toma

MACH
Member Awards for Chapter Help

EAA's MACH Program

Congratulations to all our MACH Draw Winners!

The first draw was held at the convention on Saturday afternoon. At 14h00 the cut-off for entries was made. A list of names and numbers was then generated by the program. For every percentage point, a ticket was generated by the system (ie – if your Mach score was .80, you had 80 points and 80 tickets in the "hat"). The MACH system automatically generated ticket numbers for each MACH point earned to the various matching member names, e.g. if you had 80 points, you had 80 different ticket numbers allocated to your member name.

This complete list is time stamped and is saved on the MACH server for auditing purposes. The exported list is unedited and contains a total of 46180 tickets.

At 17h15 Mark Clulow, David Toma, Sean Cronin, Paul Lastrucci, Rob Jonkers and Neil Bowden met for the draw. An internet random number generator was then used to draw the numbers.

The specific prize was confirmed before each draw. The ticket number drawn was then called out to Marie, who looked up the ticket number on the full list of 46180 entries. The specific member name related to the drawn ticket number was then identified and announced by Marie.

When Karl Jensen's name was announced as winner of the trip to Oshkosh, we were all both surprised and very pleased. Karl was the top points-earner and it was good to see the system favoured those who had put so much effort into supporting EAA!

A big thanks to all who joined in on the MACH program and a big thanks to all our sponsors, Sean Cronin and Chock Norris, Timothy Semetsing and Absolute Aviation, Niren Chitoki and Comet Aviation, and AAT!

Prize Winners in our 2021 MACH Draw

- Winner trip to Oshkosh – Karl Jensen
- Winner AV100 Headset Comet Aviation – Dolph Kruger
- Winner Gill Battery Charger Absolute Aviation – Jan Hattingh
- Winners Glutek Chock Norris Chocks & Syphon Tube Sets – Ronell Myburgh and Thomas Dunford

Well deserved winner of the trip to Oshkosh – Karl Jensen!

A **BIG** Thanks to all our sponsors!

COMET AVIATION SUPPLIES

ABSOLUTE AVIATION

GLUTEK ENGINEERING

AAT AIR ADVENTURE TOURS

EAA Chapter 322 May Meeting

Featuring Allan Vogel

Please note that our monthly meeting this month will be held on Zoom only and not at Dickie Fritz. Sean Cronin, EAA Chapter 322 Vice-Chairman, will be presenting this month's meeting.

Besides the usual EAA business, we will feature a safety talk by Captain Rob Brand on the "Startle Effect". This will be followed by Karl Jensen's monthly event "Round-up", reporting on all the good things that have happened over the past month. Our featured presenter, Allan Vogel, will then take up the reins, with his very interesting talk!

A Bit about Allan!

Born in Johannesburg and schooled at FDR & Queens College Eastern Cape. Served in the SAP Special Units SOWETO until 1992. Special Investigations until 1999 and moved to France then UK. Always had an interest in aviation since an early age and very involved in aerial operations in the SAP. Trained with the RAF and acquired PPL and flown several interesting types from Tiger Moth, Pitts, Extra 300, Cub and Bulldog. A member of the Historic Aircraft Association and on the management team. I work closely with aircraft restoration companies all over the world and very involved with aircraft restoration in particular, a C-54 Skymaster in the UK. Flew a Piper L4 to Normandy with 47 other L Birds in 2019 for the 75th Anniversary of D-Day.

My business in aircraft brokering with Historic and Classic Aircraft Sales Ltd UK takes me around the world and I focus on the classics and rare types from WW1 types to the elusive WW2 types such as the MiG-3 and Yak 1's and the Aerocobra and the beautiful Spitfire or P51's. I'm always searching for the Holy Grail of collectibles and follow up on leads all over the world. I provide valuations on behalf of owners and insurance brokers. Our website is www.hcas.me.uk

EAA SOUTH AFRICA

NOTICE OF THE 2021 ANNUAL GENERAL MEETING OF THE EXPERIMENTAL AIRCRAFT ASSOCIATION OF SOUTH AFRICA

Virtual Zoom Gathering on 25 May 2021 at 18h30

Notice is hereby given that the Annual General Meeting of the Experimental Aircraft Association of South Africa will be held virtually on 25th May at 18h30. A zoom link will be circulated to all paid-up members.

Meeting Requirements

Quorum: *30 Bona fide National EAA members in good standing. (Note that Chapter membership only does not qualify)*

Proposals: *Any proposals for discussion must be received within 7 days prior to the AGM (deadline 18 May 2021 and submitted to the secretary via email to rsvp@eaa.org.za)*

Proxy: No proxy votes will be accepted *as members will be afforded a week to submit votes online. Voting will open a week before the AGM and close at the opening of the AGM.*

Call for Nominations: *Please submit your nominations by reply email. Nominations will close a week prior to the AGM before voting opens. Please ensure that your nominees have agreed to accept your nomination. Please nominate your Executive Leadership.*

EAA AGM 2021 : NOMINATION – Experimental Aircraft Association of South Africa

Paul Lastrucci
AGM Co-ordinator
EAA of South Africa

EAA Chapter 322 is inviting you to a scheduled Zoom Meeting

Topic: EAA 322 Monthly Gathering : May 2021
Time: 5 May 2021 06:00 PM Harare, Pretoria

Join Zoom Meeting
https://us02web.zoom.us/j/82626042499?pwd=T2dtWG11eGNobGo2SldVcVFtdVJjdz09
Meeting ID: 826 2604 2499
Passcode: EAA322

- **Safety Talk by Capt Rob Brand**
- **Karl's Event Round-up**
- **Presentation by Allan Vogel - Chairman & Project Manager of the C-54 Skymaster Trust and Broker at Historic & Classic Aircraft Sales UK**

THANK YOU!

Fly CemAir

JOHANNESBURG FLYING ACADEMY

Many thanks to Alan Stewart and the Johannesburg Flying Academy and Ronell Myburgh and CemAir for help with sponsoring the EAA 2021 Convention and Aero Club's Air Week

FOR OUR SAFETY – Karl Jensen
EAA Chapter 322

A mid-air collision is something we all fear. The recent collision of 2 Cessna 172 type aircraft near the Grasmere VOR at night fatally injuring both Instructors and their students was a dreadful occurrence. I extend my sincerest condolences to the family and friends of the victims as well as to the operators of the aircraft.

Was this accident avoidable – besides remaining on the ground, I do not know the answer and do not want to conjecture. I believe as pilots we must all consider ways to make our flying safer and ensure that we do not have a repeat, becoming the victims. It is time for introspection for us all.

The rapid development of anti-collision aviation technology is fantastic. There is however a caveat, that being spending more time heads down in the cockpit. As recreational flyers, I ask; do we not fly to be able to look outside our aircraft to enjoy this wonderful pursuit as our main reason for flying? Of course, we all want to be comfortably competent and utilise the technological advances and be able to use our aircraft safely for many other purposes. The late Genl Des Barker repeatedly harped on the matter of automatic fixation with the available smart technology causing aircrew to be heads down and relying on automatics improperly and inappropriately used which resulted in massive disasters. We must stick to the basic rules and never waiver:

Aviate, Navigate, Communicate!

The recent jamming of the Johannesburg Special Rules East frequency 125.4Mhz certainly got my attention as I regularly fly in this area. I like to believe the authorities tackled this problem with verve, but it none the less took several weeks to resolve the problem. There were informal suggestions to use 124.8Mhz instead, a deadly unthought out idea with some pilots possibly aware and others not. This would have led to a total false sense of security and belief that you would be situationally aware in our busy skies.

While on the subject, let us tighten up on our R/T procedures and encourage others to do so. I believe by making a conscious effort to be more disciplined, we can fly more safely. I have for years ranted about the improper use of words that have crept like a cancer into everyday communications of 'CURRENTLY' and 'ROUTEING'. I receive a lot of ribbing about this and take it from whence it comes. There is also a common request '…any traffic in the vicinity, please advise' or 'please keep a look out' – isn't this the reason we make the inflight position reports? I know some of this is incorrectly taught by professional flying instructors.

Why not use the correct exact terminology POSITION, instead of CURRENTLY and then NEXT POSITION and if necessary VIA or DESTINATION.

Fly safe and maintain a good lookout!

CIRCUS AIRFIELD CLOSURE

Circus Airfield (MLCI)

Co-ordinates S26 29 00 E 28 03 35 situated off the R59 highway between Alberton and Vereeniging will be closing indefinitely as an un-manned airfield from 1-May-2021

EAA National AGM
25th May 2021 18h30
VIRTUAL ON ZOOM

SACAA New Licence Card

EAA member Marie Reddy receives first PPL Card!

I have read about the SACAA proposed card licences keenly and much like most of our EAA members – I wondered what they will look like and how will they work ?

Marie Reddy with The Director of Civil Aviation, Ms Poppy Khoza

On 21st April 2021, SACAA launched a brilliant new initiative. To my surprise, I was invited to attend the launch and I am truly honoured to have received the first PPL card to be issued in South Africa. I am certain there are way more worthy participants but I can only say thank you to SACAA for making the process so simple for me. I still have my licence books but I no longer have to carry them on me when flying as all of my information is accessible through the scan code on my card. It's pretty-nifty.

As an outsider, I can only imagine that this will be a mammoth task for SACAA to undertake and it will take some time to get all the required data electronically recorded. While we all hope that this will happen overnight, please let's be realistic and apply well in advance and understand that we are one of many applicants so it may take a while to get this to SACAA's desired delivery standard. When it is all smooth sailing, it will be a serious convenience factor to all licence holders.

The roll-out of the card licence will take place by means of a phased approach, starting with the Private Pilot's Licence and Student Pilot's Integrated Licence on 03 May 2021. Your normal submission for a new or renewed licence will follow the same procedure but will be required to be accompanied by a colour passport size photo and fees will be payable 2 years in advance as opposed to one year as previously required.
Additional information and resources :

http://www.caa.co.za/Pages/Personnel%20Licensing/NewLicCards.aspx

FAQ's here
http://www.caa.co.za/Pages/Personnel%20Licensing/NewLicCardsFAQ.aspx

SOUTH AFRICAN CIVIL AVIATION AUTHORITY	REPUBLIC OF SOUTH AFRICA CIVIL AVIATION AUTHORITY	SACAA Private Bag X73 Halfway House 1685
Tel: (011) 545-1323 E-Mail: niemandj@caa.co.za	GENERAL NOTICE # PEL 004 Revision 1	DATED 21 April 2021

LAUNCHING OF THE SACAA CARD LICENCE

On Wednesday, 21 April 2021, the South African Civil Aviation Authority (SACAA) launched its new Card Licence system, which replaces the old booklets that used to identify personnel licence holders. The launch of the card licence moves the SACAA one step forward towards achieving its goal of a fully integrated and organisation-wide Information and Communications Technology (ICT) system that will enhance the Regulator's service offering to the civil aviation industry.

A single Card Licence, without expiry dates, will be issued for each of the following licence groupings. A person holding multiple licences for each group will be issued with three (3) card licences.

- AME and RMT
- ATS
- RPL, NPL, GPL, CC, FE, FB, SPLIC, PPL, CPL and ATPL
- **The SPL will, however, not be issued in a card format.**

Validity period of licences will still be applicable. All expiry dates, ratings, and other information such as limitations, restrictions and endorsements will be accessible on the portal, which can be scanned through the 2D code at the back of the card.

As all licensing actions are processed electronically and information is stored on the cloud, a card will not be reprinted unless requested by the holder, due to deterioration of the card, upgrading or downgrading of a licence, or if lost or stolen. A duplicate fee as per Part 187 will be payable upon replacement of a card.

A pilot issued with a Card Licence may continue using his or her paper-based licence until the competency of such licence expires.

NEW COMPULSARY REQUIREMENTS

- A Card Licence will be issued upon submission of the application documentation for either a new licence or the renewal of the competency of a licence. The documentation must be accompanied by a recent passport photo (35 x 45mm), preferably in colour. In the case of a digital submission, the passport photo shall be of a high resolution.

- Validity of the following licences will be for a period of 2 years, subject to the submission of a new revalidation check. The annual currency fee that was paid for 1 year, will now be payable for 2 years (i.e., annual currency fee X 2).

  PPL (VFR)
  CPL (VFR)
  SPLIC
  NPL
  GPL

- The annual currency fee, payable for 1 year, is still applicable to those who are not yet due for a revalidation check.

The card licence project will be rolled out in the following five (5) phases:

PHASES	TYPE OF LICENCE	ROLL-OUT DATE
1	Private Pilot Licence Student Pilot Integrated Licence	03 May 2021
2	National Pilot Licence Glider Pilot Licence Cabin Crew Licence	To be communicated
3	Hot Air Balloon Licence Remote Pilot Licence Flight Engineer Licence	To be communicated
4	Aircraft Maintenance Engineer Licence Air Traffic Control Licence	To be communicated
5	Commercial Pilot Licence Airline Transport Licence Validations of all licences	To be communicated

Continuous communication on the roll-out phases will take place via the SACAA website and other online media platforms.

Please visit the following link for any information in this regard:

http://www.caa.co.za/Pages/Personnel%20Licensing/NewLicCards.aspx

Issued by the South African Civil Aviation Authority (SACAA)		
	**JOHAN NIEMAND**	**21 April 2021**
SENIOR MANAGER: PERSONNEL LICENSING	**NAME IN BLOCK LETTERS**	**DATE**

EAA SA 2021 Convention

And Aero Club Centenary +1 at Airweek Middelburg

Heartiest congratulations to all who contributed to and took part at Airweek from 23 – 27 April 2021. It was quite apparent that slick organisation and much effort was expended. It was obvious that 'cabin fever' resulting from the restrictions of the 'Panicdemic' lockdown powered the need for a fly-in. The best count for aircraft on the ground at any one time was 164 from an aerial phot by Bruce 'Bear' Perkins and submitted by Athol Franz. By calculation with the rate of arrivals and departures over the weekend, there were at least 260 aircraft that visited.

Arrivals commenced on the Friday with about 40 aircraft arriving and many others support crew arriving by road. Middelburg is an ideal venue for Airweek with multiple runways and infrastructure situated away from restrictive airspace. An enormous vote of thanks must go to Richardt Lovett who made his magnificent hangar and facilities available for our use as the centre point of activities. The hangar was appropriately adorned with Aero Club banners depicting 100 years of existence. Aero Club also had a marquee housing a mini museum with the history of the Aero Club in pictures and artifacts. It was gratifying to see commercial enterprise support and with most of the Aero Club affiliates participating. The SA aviation media were in full attendance and have supplied nay of the accompanying pictures. We are grateful for the media support of EAA and Aero Club activities which provide us with much appreciated publicity. I noted Athol Franz from African Pilot, Garth Calitz from Flightline Weekly and Willie Bodenstein from Pilots Post. Their individual reports on Airweek have been most complimentary.

As a member of EAA, I was particularly proud of the EAA participation from Friday to Sunday with most aircraft flown in by our members. Neil Bowden, our Chapter 322 Chairman and David Toma, President of EAA SA had certainly tried to make EAA's presence significant - and succeeded. The forums were well attended and good attendance at the Saturday evening dinner and award function. I was unable to attend the awards function and hopefully that will be reported on too

With the list of award winners. Neil, with his experience of organising the SA contingent camp over 23 years has introduced refreshing innovations in the way Chapter 322 functions.

The EAA "shop"

Nigel Musgrave EAA Chapter 322, our EAA SA National Safety Officer, ensured that the weekend took place with no reportable incidents, a great tribute too to all who took part. The ATNS AFIS were manned by Marlize Scheepers from Lanseria and Mark from Rand, both members of the ATNS Special Events personnel. At times it was incredibly busy with their task aggravated by inappropriate 'currently', 'routeing' and unnecessary lengthy radio transmissions. As the Airweek was not classified a 'Special Air Event', but a mere fly-in, no fly-bys were permitted and only aircraft that were operated under the auspices of an AOC (Air Operating Certificate) were able to do official displays. Two CAA Special Events Inspectors led by the amicable Piet Fourie were present throughout the weekend.

Could there be a better view to wake up to?

The Cirrus Jet made a welcome appearance

The EAA Annual Convention, the highlight of our year, normally sees the Annual General Meeting of the organisation. It was decided earlier that an AGM via Zoom would allow more members to participate. The date for the AGM is 25th May 2021.

Our mini "Oshkosh" in Middelburg

The EAA parking was filled with interesting aircraft

EAA SA National President David Toma addresses members at an EAA forum.

Swarm of Bat Hawks roosting at Middelburg

Richard Bovell, your Hot Air Balloon has slipped its surly bonds! by Daniel Ralafeta

Ever smiling Horace Blok, EAA Chapter 322, from Mossel Bay with Scully Levin with Puma Flying Lions Harvard.

Mike Wright EAA Chapter 1262 from Wings Park, East London in his Ventura

Flying Lions immaculate display

Rene Clulow in the Aero Club's Museum Display

Rodney Chinn arrives in Gavin Brown's (EAA Chapter 322) restored Stampe

EAA 2021 Convention

All the Awards!

1st Place Best Plans Built Aircraft & Grand Champion Homebuilt Aircraft
Johan van Zyl RV7 ZU VZJ

1st Place Warbird Aircraft
Gavin Brown's DHC1 Chipmink ZU COX

1st Place Concourse d' Elegance & Best Tube & Fabric Aircraft
Andy Lawrence PA 12 Super Cruiser ZU FPU

2nd Place Warbird Aircraft
Krause Venter Piaggio P166 S Albatross

1st Place Composite Aircraft
Dieter Bock Lancair Legacy ZU DCB

3rd Place Warbird Aircraft
Jeff Crause Auster Mk 5 ZS WBF

1st Place Wood Aircraft
Tony van den Heuvel GP 4 Osprey ZU CLC

1st Place Classic Aircraft
Jan Loubser DHC1 ZU DXO

1st Place Metal Aircraft
Glynn Antel RV 7 ZU MAD

2nd Place Classic Aircraft
Tom Burge Fairchild FA24R ZS VYM

1st Place Vintage Aircraft
Gavin Brown's Stampe SV.4C ZS EUU

3rd Place Classic Aircraft
Arjan Schaap Ryan Navion ZU DAB

2nd Place Tube & Fabric Aircraft
Hans de Beer Super L21

Longest Flight
Hartog Blok Flight from Mossel Bay

EAA Convention Gallery

Friday night sunset – already a good turnout of aircraft

Campers and aircraft filling up the field on Friday afternoon

Campers and aircraft filling up the field on Friday afternoon


OFFEE TO THE STREET
CONTACT 081 376 1670


ZS-UIM


THE SPIRIT OF AVIATION
WIN A TRIP TO
OSHKOSH!
JOIN EAA
MACH

EAA's Pre-Flight Competition – Karl's C170 was made up with a couple of faults, contestants had to find them. Winner was Arno Le Grange

Alan & Cathy camping under the wing!

Sling's new High Wing Prototype made a welcome appearance with new enlarged tail feathers

We were treated to some great aerobatics

A swarm of Bat Hawks

Members having some formation fun!

Thanks to Anne-Louise Woods and her team we made good sales of EAA merchandise

The Aircraft Judging team hard at work

The 13 Ship RV8 Formation

Tango the Tri-Pacer

The story about the story

Tango is a Piper Tri-Pacer and more than anything, Tango loves to fly. So reads the first line on the back of a small children's book about our families Tri-Pacer. It is unusual for an aircraft to stay in a family for more than a generation, I consider ourselves privileged that four generations of our family have enjoyed the company of Tango, granted the fourth generation is only 2.5, but she's probably the world's most enthusiastic Tango fan!

Tango's a pretty much stock '55 model Piper Tri-Pacer. Other than a radio, transponder and shoulder straps not much has changed since he rolled off the production line in Lockhaven over half a century ago. Tango was imported new into SA and assembled here. He had one owner before my grandfather bought him in '65, since then he has been based in KZN. Tango's fabric has been redone three times, once as a result of being flipped when the nose wheel had an altercation with a porcupine hole on landing, once as a result of hail and in the late 90's due to deteriorating fabric condition. He runs a standard 150hp O320 narrow deck that was top overhauled in 2018. Today he is in great condition and all being well will run a decade or two more before needing any sort of major attention. I won't go into the virtues and pleasantries of owning and flying a Tri-Pacer as I'm sure many of you will already be familiar with these fantastic little aircraft, if you're not I recommend trying to find one and getting acquainted. What I will add is if you are looking at becoming a first-time aircraft owner, give a Tri-Pacer a serious look!

Having been a part of the family for 56 years Tango has been involved in his fair share of adventures, he has travelled all around South Africa, up to Namibia and recently Zambia and back, taken newlywed couples on honeymoon, flown as the camera ship (and subject) for the late John Miller and featured in the German film Grzimek, based on the well-known book *Serengeti Shall Not Die* to name but a few of his exploits. It was this collection of great experiences that gave my father the notion to write a series of children's stories about Tango and his adventures. He and I spent many a late-night chatting in our workshop working on our (not yet complete) RV7. We would discuss all manner of things, but the topic of a Tango the Tri-Pacer series was a recurring one. We both felt the stories should be factual but fun, we wanted to maintain the mechanics, engineering and physics of flight but it should be subtle enough that it would not bore or bamboozle the young reader or drown out the magic of aviation.

We were both adamant that in the illustrations Tango should very obviously be a Tri-Pacer but that one could use the Tri-Pacers existing features to give the illustrations character and
expression. At the time of my father's passing in a light aircraft crash with well-known builder/pilot Dave Grosvenor the stories had not progressed further than a workshop discussion and some jotted down ideas.

Once the dust had settled following the loss of my father, I decided to pursue the idea of a series of children's stories. Over the next year I sporadically tapped away on stories and wrote a few, eventually settling on Tango and the Rescue to be the first story in the series. Happy with the writing I set out on what I thought would be the simple process of finding an illustrator, it wasn't quite so simple! I had some fantastic people try and help me out and some great artists but for various reasons nothing really took. So eventually the idea slipped away as I got busy with other aspects of life. The file sat on my desktop taunting me until a friend introduced me to the works of legendary artist Darryl Legg who once approached readily agreed to illustrate my short story. From there it got exciting as the draft images went back and forth and soon I had final water colour paintings in my hands. Initially I intended to just print a few copies for friends and family, but a well-known Underberg vet and author Tod Collins put his foot down and gave me the firm nudge to go all the way to publication. Under his guidance I made the use of the services of a small private publishers in Durban and at the end of 2020 had my first book in my hands! From there it has been a pleasant surprise to see how well the book has been received, especially in the USA. The warm reception to the book has got me thinking another by year end may not be a bad plan, so watch this space! The books are available in store and online in South Africa at Pilots 'n Planes as well retailtherapyonline.co.za and internationally via Amazon.

EAA Merchandise

Wear your colours with pride!

EAA recently ordered in a range of embroidered golf shirts and caps. Most of these goods were sold at the convention, but, good news is, some stock is still available!

If you want to get your hands on any of these goods, please e mail your order to contact.eaasa@gmail and we will arrange delivery to you.

A wide range of EAA caps are available at R60 each and golf shirts at R200 each

Rhino Park Fly-in

"Steady Climb Initiative 10th April 2021

Although this was not an EAA event, many of our members took part. The weather for flying on the day was idyllic. I was unable to take part as I attended the Memorial of Charmaine, wife of Brian (The General) Stableford, who had tragically succumbed 2 weeks after being stung by a little brown paper wasp in her garden. I have always known these insects as hornets. Our thoughts are with Brian and family as Charmaine wends her way to better places.

Once again, our ever faithful and dedicated EAA National Safety Officer, Nigel Musgrave officiated at Rhino Park ensuring an incident free fly-in.

ZS UKU KR 2 – originally built by the then KR 2 distributor, Sakkie Halgreen, in 1977

ZS VXI Pietenpol Sky Scout single seater "Piet" belonging to Louwtjie Vosloo

Yak 52 - ZU YAK

The line-up at Rhino Park

Sean Cronin & Neil Bowden passing Pretoria in Sling 2 - ZU OSH

Nothing beats a Boerie Roll for breakfast!

Nigel Musgrave keeping things safe

C 150 ZS TAO

The RV 8 Gang

NASA Ingenuity Mars Helicopter Update

(All you need to know https://mars.nasa.gov/technology/helicopter/)

We have been following the first powered flight ever on another planet. This helicopter has performed so well that there is now a suggestion of addition tests and tasks to the original test flights. The activity thus far follows :

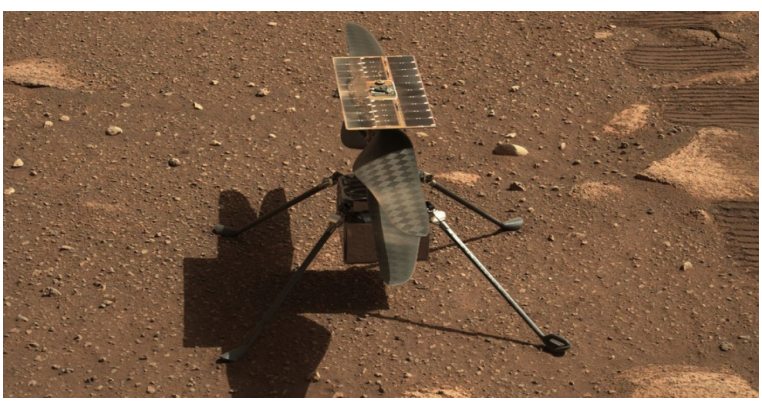
Tech Specs

Mass	1.8 kilograms
Weight	4 pounds on Earth; 1.5 pounds on Mars
Width	Total length of rotors: ~4 feet (~1.2 meters) tip to tip
Power	Solar panel charges Lithium-ion batteries, providing enough energy for one 90-second flight per Martian day (~350 Watts of average power during flight)
Blade span	Just under 4 feet (1.2 meters)
Flight range	Up to 980 feet (300 meters)
Flight altitude	Up to 15 feet (5 meters)
Flight environment	Thin atmosphere, less than 1% as dense as Earth's

MARS Helicopter Status Update : DIARY

April 08, 2021 : When Should Ingenuity Fly?

Written by Bob Balaram, Chief Engineer for the Mars Helicopter Project at NASA's Jet Propulsion Laboratory



NASA's Ingenuity Mars helicopter is seen here in a close-up taken by Mastcam-Z, a pair of zoomable cameras aboard the Perseverance rover. This image was taken on April 5, the 45th Martian day, or sol, of the mission.'
Credit: NASA/JPL-Caltech/ASU.

While the Ingenuity team has been focusing on getting ready for its first flight on Mars, the team has also been busy selecting a time for that flight. A number of factors go into this important decision.

First, Ingenuity cannot fly at night. It depends on its camera to observe the ground while navigating, and that wouldn't be possible at night. If it weren't for that, night-time would be a good time for a helicopter to fly on Mars. The air density would be higher, which would make flying easier.

Next, Ingenuity needs to be a good guest. It needs to coordinate all its activities with the Perseverance rover. For example, Perseverance is keeping a watchful eye on Ingenuity with the rover's cameras, and needs to know when we are planning to do certain activities. There are also times when Perseverance is busy with transmitting on the radio to relay satellites overhead, or managing the many science instruments on the rover, or performing other spacecraft operations. Through all this, the Perseverance operations team has been fantastic in meeting Ingenuity's needs. A big thanks to them!

When Ingenuity is flying, it uses a lot of power-many hundreds of watts. The lithium-ion battery that powers Ingenuity's two main propulsion and six blade pitch control motors needs to handle power surges as Ingenuity flies and fights any winds and gusts it may encounter. The helicopter's voltage needs to be maintained so that motors do not stall or electronic devices get in trouble. Ingenuity comes out of the cold Martian night without much energy in its battery, so it needs to bask in the Sun to warm up and let the solar panel charge up the battery enough to handle the power demands of the day. All this means that Ingenuity cannot fly too early in the morning. Midday and afternoon are far better.

Flight can't happen too late in the Martian day either. A long flight late in the afternoon could deplete the battery without giving the Sun a chance to recharge it. You don't want to go into that cold Martian night without a good bit of energy in the battery!

Another consideration is the expected winds at flight time. Ingenuity has been tested in simulated winds, using computer models as well as a big "wind-wall" the team built in one of our test chambers at JPL. However, we can't test over the entire range of wind conditions that one might experience on Mars. The biggest risk is at takeoff and landing, when an untimely gust could present challenges. To help with this, we have a "weather forecast" team that provides us with the best estimate of Martian winds using computer models and initial data from weather sensors on the Perseverance rover. I never knew that weather forecasts for Mars could be so interesting!

The Ingenuity operations team is considering all of these factors in the selection of the best flight time. The uplink team bakes these times into the sequences that get uploaded in the days leading up to first flight.

And then, Ingenuity will try to fly on Mars!
We will all be watching and waiting...

April 10, 2021 : Mars Helicopter Flight Delayed to No Earlier than April 14

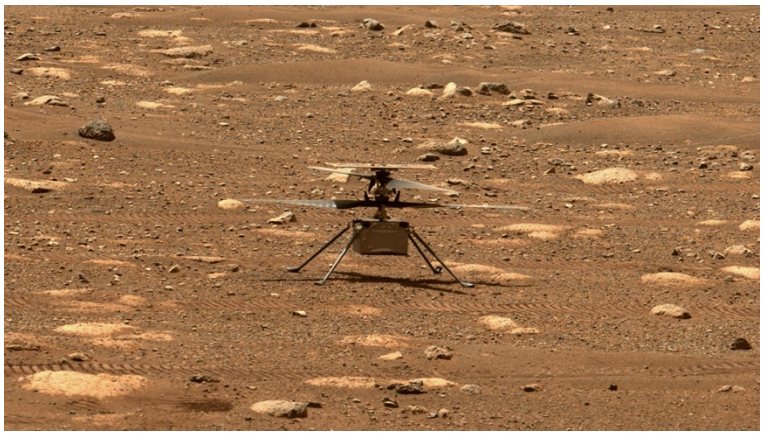
Written by NASA/JPL

Based on data from the Ingenuity Mars helicopter that arrived late Friday night, NASA has chosen to reschedule the Ingenuity Mars Helicopter’s first experimental flight to no earlier than April 14.

During a high-speed spin test of the rotors on Friday, the command sequence controlling the test ended early due to a “watchdog” timer expiration. This occurred as it was trying to transition the flight computer from ‘Pre-Flight’ to ‘Flight’ mode. The helicopter is safe and healthy and communicated its full telemetry set to Earth.

The watchdog timer oversees the command sequence and alerts the system to any potential issues. It helps the system stay safe by not proceeding if an issue is observed and worked as planned.

The helicopter team is reviewing telemetry to diagnose and understand the issue. Following that, they will reschedule the full-speed test.



NASA’s Ingenuity helicopter unlocked its rotor blades, allowing them to spin freely, on April 7, 2021, the 47th Martian day, or sol, of the mission. Credit: NASA/JPL-Caltech/ASU

April 12, 2021 : Work Progresses Toward Ingenuity’s First Flight on Mars

Written by NASA/JPL

The Ingenuity team has identified a software solution for the command sequence issue identified on Sol 49 (April 9) during a planned high-speed spin-up test of the helicopter’s rotors. Over the weekend, the team considered and tested multiple potential solutions to this issue, concluding that minor modification and reinstallation of Ingenuity’s flight control software is the most robust path forward. This software update will modify the process by which the two flight controllers boot up, allowing the hardware and software to safely transition to the flight state. Modifications to the flight software are being independently reviewed and validated today and tomorrow in testbeds at JPL.

While the development of the new software change is straightforward, the process of validating it and completing its uplink to Ingenuity will take some time. A detailed timeline for rescheduling the high-speed spin-up test and first flight is still in process. The process of updating Ingenuity’s flight control software will follow established processes for validation with careful and deliberate steps to move the new software through the rover to the base station and then to the helicopter. Intermediate milestones include:

Diagnose the issue and develop potential solutions
Develop/validate and upload software
Load flight software onto flight controllers
Boot Ingenuity on new flight software

Once we have passed these milestones, we will prepare Ingenuity for its first flight, which will take several sols, or Mars days. Our best estimate of a targeted flight date is fluid right now,

but we are working toward achieving these milestones and will set a flight date next week. We are confident in the team's ability to work through this challenge and prepare for Ingenuity's historic first controlled powered flight on another planet.
Ingenuity continues to be healthy on the surface on Mars. Critical functions such as power, communications, and thermal control are stable. It is not unexpected for a technology demonstration like this to encounter challenges that need to be worked in real time. The high-risk, high-reward approach we have taken to the first powered, controlled flight on another planet allows us to push the performance envelope in ways we could not with a mission designed to last for years such as Perseverance. In the meantime, while the Ingenuity team does its work, Perseverance will continue to do science with its suite of instruments and is gearing up for a test of the MOXIE technology demonstration.

April 16, 2021 : Working the Challenge - Two Paths to First Flight on Mars

Written by the Ingenuity Flight Team

NASA's Mars Perseverance rover acquired this Image of the Ingenuity Mars Helicopter using its Left Mastcam-Z camera, on Apr. 16, 2021 (Sol 55).
Credit: NASA/JPL-Caltech/ASU

Today, April 16, on the 154th anniversary of Wilbur Wright's birth, the Ingenuity flight team received information that the helicopter was able to complete a rapid spin test. The completion of the full-speed spin is an important milestone on the path to flight as the team continues to work on the command sequence issue identified on Sol 49 (April 9).

How did we get to this milestone? As with any engineering challenge, there are multiple approaches that are considered. In this case, the team has been working two potential solutions in parallel. The approach that led to today's successful spin test entailed adding a few commands to the flight sequence. This approach was tested extensively on both Earth and Mars, and was performed without jeopardizing the safety of the helicopter. A second approach requires minor modification and reinstallation of Ingenuity's flight control software. The software swap is a straightforward fix to a known issue. But, it will take a bit longer to perform and is a modification to software that has remained stable and unchanged for close to two years. Validation and testing have taken several days, and transfer and loading of these new files will take several more.

Which approach to take? Later tonight, a decision meeting is planned to review all the data from both solution paths, including the analyses, testing, and validation efforts—both here at JPL and on Mars. We will then select the path forward for a first flight. We know people are eager to learn the first flight date, so we'll update this blog on Saturday morning if a flight date decision is reached.

What we've learned from this experience is: working any challenge means all approaches should be considered, even those that may involve risk. Without risk, there is no reward. Just ask the Wright brothers! Working issues in parallel is the hallmark of so many engineering efforts, and we're proud of what our team has accomplished this week. We'll keep you posted on our progress toward the first powered flight on Mars.

April 17, 2021 : Why We Choose to Try Our First Helicopter Flight on Monday

Written by MiMi Aung, Ingenuity Mars Helicopter Project Manager at NASA's Jet Propulsion Laboratory

At 12:31 a.m. PDT on Monday, April 19, 2021, the Ingenuity helicopter team is going to attempt the first ever powered, controlled flight on another planet. We are optimistic that the helicopter will be able to take off from the Martian surface at this time; however, this is a test and we are prepared that it may not occur. Let me explain.

Ingenuity is a technology experiment. As such, our plan is to push the envelope and learn by doing. We take risks that other missions cannot, weighing each step carefully.
Over the last week, we've been testing the two solutions to address the "watchdog" timer issue that prevented the helicopter from transitioning to "flight mode" and performing a high-speed spin test of the rotors on April 9. These solutions, which have each been verified for use in flight are: 1) adjusting the command sequence from Earth to slightly alter the timing of this transition, and 2) modifying and reinstalling the existing flight control software, which has been stable and healthy for close to two years. The first solution requires adding a few commands to the flight operations sequence and has been tested on both Earth and Mars. From testing this technique on Ingenuity over the last few days, we know this approach is likely to allow us to transition to flight mode and prepare for lift-off about 85% of the time. This solution leaves the helicopter safe if the transition to flight mode is not completed. On Friday, we employed this solution to perform our first-ever high-speed spin test on Mars.

This solution is the least disruptive to a helicopter that, up until we identified the watchdog issue, has been behaving just as we expected. It is the most straightforward, since we do not have to change its configuration.

We also know that if the first attempt does not work on Monday, we can try these commands again, with good probability that subsequent tries in the days following would work even if the first doesn't. For these reasons, we've chosen to pursue this path.

Because engineers believe in back-up plans, we have also been working this week on the second solution, which requires modification and reinstallation of Ingenuity's flight control software. The new software for this solution has been transmitted to NASA's Perseverance rover, which hosts the helicopter base station that ultimately communicates with Ingenuity. If our initial approach to flight does not work, the rover will send the new flight control software to the helicopter. We will then require several additional days of preparation to load and test the new software on Ingenuity, redo the rotor tests in this new configuration, and recycle for a first flight attempt.

Our team considers Monday's attempted first flight like a rocket launch: We're doing everything we can to make it a success, but we also know that we may have to scrub and try again. In engineering, there is always uncertainty, but this is what makes working on advanced technology so exciting and rewarding. We have to continually innovate and develop solutions to new challenges. And we get to try things others have only dreamed of.

Data from this first flight attempt will return to Earth a few hours following the autonomous flight. Join us at 3:15 a.m. PDT on Monday for a watch-along livestream to see if our solution works.

April 21, 2021 : We're Getting Ready for Ingenuity's Second Flight

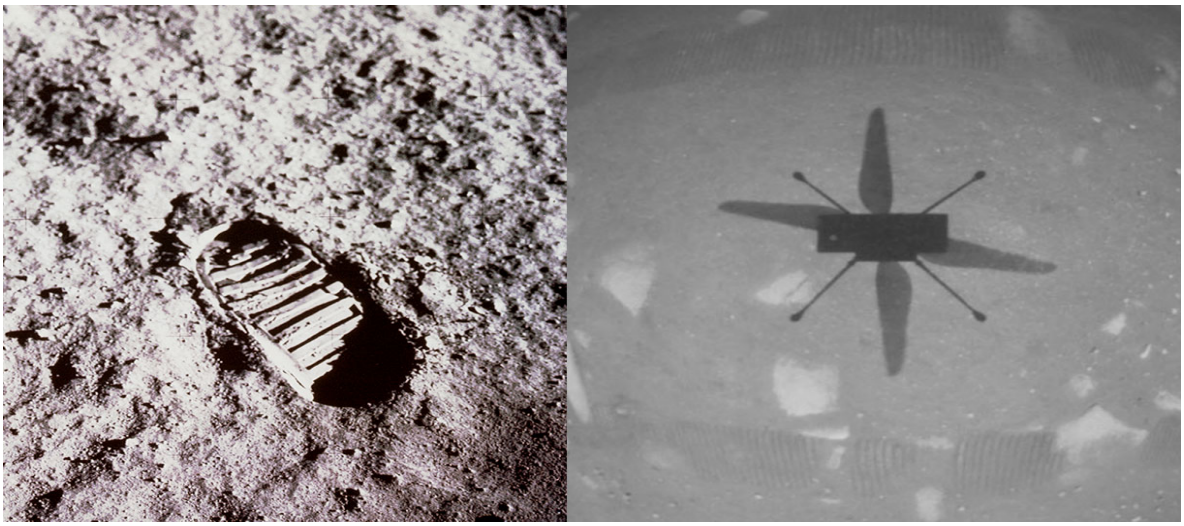
Written by MiMi Aung, Ingenuity Mars Helicopter Project Manager at NASA's Jet Propulsion Laboratory

With the first flight of Ingenuity a success, we're looking toward our second taking place on April 22, which is the 18th of the 30 sols (Martian days) of our flight test window.

For this second flight test at "Wright Brothers Field," we are targeting a takeoff time for 5:30 a.m. EDT (2:30 a.m. PDT), or 12:30 p.m. Local Mean Solar Time. But we're looking to go a little bigger this time. On the first flight, Ingenuity hovered 10 feet (3 meters) above the surface. This time around, we plan to trying climbing to 16 feet (5 meters) in this flight test. Then, after the helicopter hovers briefly, it will go into a slight tilt and move sideways for 7 feet (2 meters). Then Ingenuity will come to a stop, hover in place, and make turns to point its color camera in different directions before heading back to the center of the airfield to land. Of course, all of this is done autonomously, based on commands we sent to Perseverance to relay to Ingenuity the night before.

The imagery of the first flight Perseverance captured with its Navcam and Mastcam-Z imagers from its vantage point about 210 feet (64 meters) away at "Van Zyl Overlook" was spectacular. We're expecting more phenomenal imagery on this second flight test, which will come down beginning at approximately 9:21 a.m. EDT (6:21 a.m. PDT) that same day, April 22.

Every image we get of the helicopter on Mars is special to me: After all, this has never been done before. But I have to say that of all the images, perhaps the one that will stay with me the most is that image from the helicopter's navigation camera: Taken when the rotorcraft was 1.2 meters in the air, the black-and-white image shows the shadow of our beloved Ingenuity, with her two rotors, over the surface of Wright Brothers Field. While it's up to others to decide the image's historical significance of this moment, when I first saw it, I immediately thought of the picture Buzz Aldrin took of his boot print on the lunar surface. That iconic image from Apollo 11 said "we walked on the Moon;" ours says "we flew on another world."



Left to right: Buzz Aldrin took this iconic image of a bootprint on the Moon during the Apollo 11 moonwalk on July 20, 1969. NASA's Ingenuity Mars Helicopter took this shot, capturing its own shadow, while hovering over the Martian surface on April 19, 2021, during the first instance of powered, controlled flight on another planet. It used its navigation camera, which autonomously tracks the ground during flight. Credit: NASA/JPL-Caltech

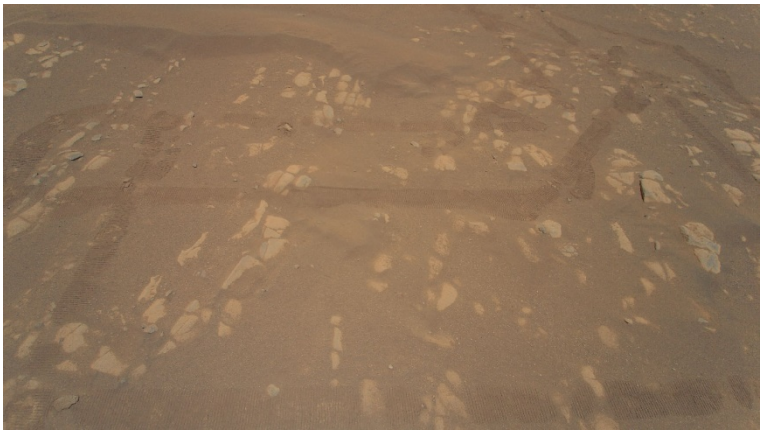
April 23, 2021 : We Are Prepping for Ingenuity's Third Flight Test

Written by Håvard Grip, Ingenuity Mars Helicopter Chief Pilot at NASA's Jet Propulsion Laboratory

Yesterday I got to write the entry for the second successful experimental flight test from "Wright Brothers Field" in the project's official logbook, which is called "The Nominal Pilot's Logbook for Planets and Moons." Next chance to make an entry is coming up fast: We're targeting our third flight for this Sunday, April 25, with initial datasets and imagery arriving in our control room at NASA's Jet Propulsion Laboratory around 7:16 a.m. PDT (10:16 a.m. EDT).

As many of you know, we carry a piece of the original Wright Flyer aboard our helicopter. Even though we are conducting our flight tests in a tenuous atmosphere over 180 million miles (290 million kilometers) from Earth, we model our methodical approach to experimental flight on the Wright brothers' approach. Our plan from Day One has been to prepare like crazy, fly, analyze the data (like crazy), and then plan for an even bolder test in the next flight.

During the second flight, on April 22, Ingenuity autonomously climbed to 5 meters (16 feet) in height, traveled 2 meters (7 feet) to the east and back, and remained airborne 51.9 seconds. It also made three turns, totaling about 276 degrees.



This is the first color image of the Martian surface taken by an aerial vehicle while it was aloft. The Ingenuity Mars Helicopter captured it with its color camera during its second successful flight test on April 22, 2021. At the time this image, Ingenuity was 17 feet (5.2 meters) above the surface. Credit: NASA/JPL-Caltech.

We're being cautious with each new foray in the skies of Mars as we continue to build confidence in the capabilities of this new exploration platform. For the third flight, we're targeting the same altitude, but we are going to open things up a bit too, increasing our max airspeed from 0.5 meters per second to 2 meters per second (about 4.5 mph) as we head 50 meters (164 feet) north and return to land at Wright Brothers Field. We're planning for a total flight time of about 80 seconds and a total distance of 100 meters (330 feet).

While that number may not seem like a lot, consider that we never moved laterally more than about two-pencil lengths when we flight-tested in the vacuum chamber here on Earth. And while the 4 meters of lateral movement in Flight Two (2 meters out and then 2 meters back) was great, providing lots of terrific data, it was still only 4 meters. As such, Flight Three is a big step, one in which Ingenuity will begin to experience freedom in the sky.

After each of our flights, I have had the privilege of filling out our logbook and capturing the flight highlights — something pilots have been doing since the early days of flying. While I've made logbook entries before as a terrestrial fixed-wing pilot, these are the most unusual entries I have made. They are also the most satisfying, not only because they represent flight on another planet, but because each notation represents a trove of valuable data that our team has spent years preparing to obtain.

Pilot Logs First Flight on Another World: *Ingenuity Mars chief pilot Håvard Grip records data of the first flight of the Ingenuity Mars Helicopter into the official pilot's logbook for the project - the "Nominal Pilot's Logbook for Planets and Moons*

April 29, 2021 : Mars Helicopter's Flight Four Rescheduled

Written by NASA/JPL

NASA's Mars Perseverance rover acquired this image using its Right Mastcam-Z camera. Mastcam-Z is a pair of cameras located high on the rover's mast. This is one still frame from a sequence captured by the camera while taking video on April 29.
Credit: NASA/JPL-Caltech/ASU/MSSS.

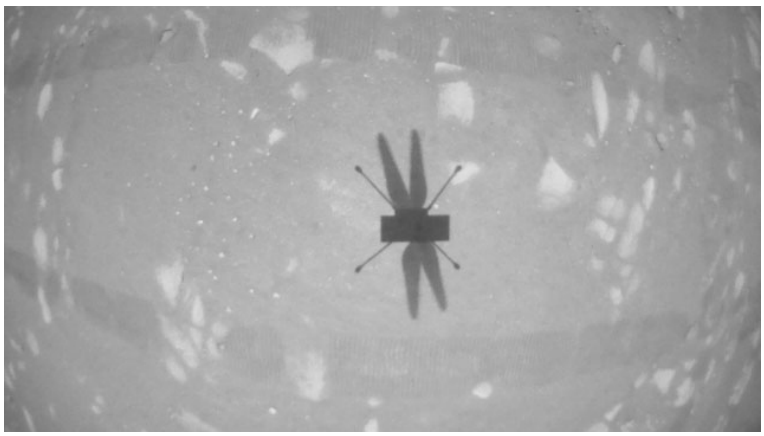
Data received from the Mars Ingenuity helicopter on Thursday morning shows the helicopter did not execute its planned fourth flight as scheduled. The helicopter is safe and in good health. Data returned during a downlink at 1:21 p.m. EDT (10:21 a.m. PDT) indicates the helicopter did not transition to flight mode, which is required for the flight to take place.

The team plans to try its fourth flight again tomorrow, April 30, 2021. The flight is scheduled for 10:46 a.m. EDT (7:46 a.m. PDT, 12:30 p.m. local Mars time), with the first data expected back at NASA's Jet Propulsion Laboratory in Southern California at 1:39 p.m. EDT (10:39 a.m. PDT).

An issue identified earlier this month showed a 15% chance for each time the helicopter attempts to fly that it would encounter a watchdog timer expiration and not transition to flight mode. Today's delay is in line with that expectation and does not prevent future flights. A briefing scheduled for Friday, April 30, to discuss next steps for the helicopter will continue as planned but will move to a new time, 11:30 a.m. EDT (8:30 a.m. PDT).

April 30, 2021 : What We're Learning About Ingenuity's Flight Control and Aerodynamic Performance

Written by Håvard Grip, Ingenuity Mars Helicopter Chief Pilot at NASA's Jet Propulsion Laboratory



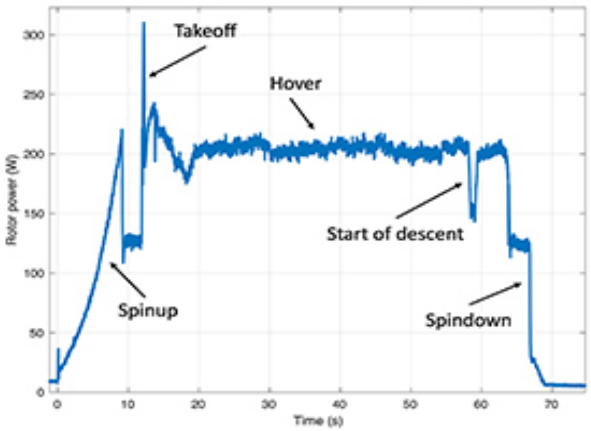
The Ingenuity Mars Helicopter's navigation camera captures the helicopter's shadow on the surface of Jezero Crater during rotorcraft's second experimental test flight on April 22, 2021. Credit: NASA/JPL-Caltech.

Before each of Ingenuity's test flights, we upload instructions that describe precisely what the flight should look like. But when it comes time to fly, the helicopter is on its own and relies on a set of flight control algorithms that we developed here on Earth before Ingenuity was even launched to Mars.
To develop those algorithms, we performed detailed modeling and computer simulation in order to understand how a helicopter would behave in a Martian environment. We followed that up with testing in a massive 25-meter-tall, 7.5-meter-diameter vacuum chamber here at JPL where we replicate the Martian atmosphere. But in all of that work, we could only approximate certain aspects of the environment. Now that Ingenuity is actually flying at Mars, we can begin to assess how things stack up against expectations. Here are some key aspects of the flight control system's performance on Mars.

Takeoff

Unlike many consumer drones, Ingenuity is not controlled by changing the rotor speeds. Instead, we control our Mars Helicopter in the same manner as full-scale terrestrial helicopters: by changing the pitch angle of the blades, which affects the airfoil "angle of attack" and thereby determines how big a "bite" the blades take out of the air. The bigger the bite, the more lift (and drag) is produced. Like a traditional helicopter, we can change the pitch angle in two ways: by using "collective control," which changes the blade pitch uniformly over the entire rotation of the blade, and by using "cyclic control," which pitches the blade up on one side of the vehicle and down on the other.
When Ingenuity takes off, the rotor is already spinning at the setpoint speed of 2,537 rpm. We take off with a sudden increase in collective control on both rotors, which causes the vehicle to "boost" off the ground. During this initial takeoff phase, we limit the control system to respond only to angular rates (how quickly the helicopter rotates or tilts). The reason for this is that we don't want the control system to be fighting against the ground, possibly resulting in undefined behavior.

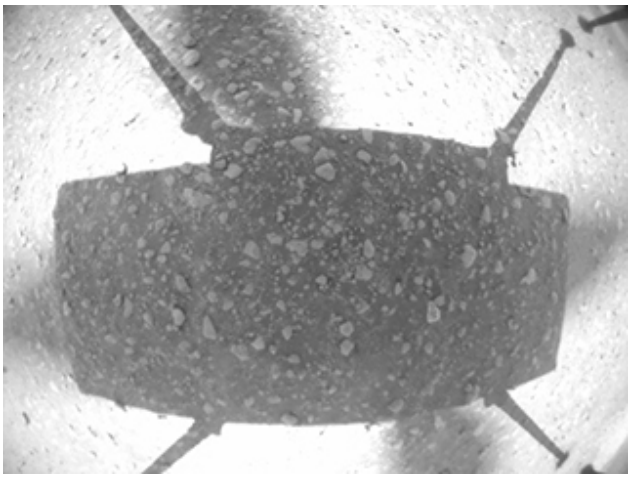
The initial takeoff phase lasts for only a split second; once the helicopter has climbed a mere 5 centimeters, the system asserts full control over the helicopter's position, velocity, and attitude. At this point we're accelerating toward a vertical climb rate of 1 meter per second.
To estimate our movements during flight, we use a set of sensors that include a laser rangefinder (for measuring altitude) and a camera. We don't use those sensors until we reach 1 meter altitude out of concern that they might be obscured by dust near the ground. Instead, we initially rely only on an inertial measurement unit (IMU) that measures accelerations and angular rates, and we integrate those measurements to estimate our movements. This is a type of "dead reckoning" navigation – comparable to measuring how far you've walked by counting your steps. It's not very accurate in the long run, but because Ingenuity takes only a couple of seconds to reach 1 meter, we can make it work.



Ingenuity's rotor power during Flight Two.
Credits: NASA/JPL-Caltech

One of the things we were curious about is how "confidently" Ingenuity would boost off the ground and reach that first threshold of 5 cm. Data from the first three flights shows that portion of the climb took about 0.25 seconds, which is very much in line with expectations and indicates that Ingenuity had no issue producing enough thrust on takeoff. During this initial boost, we expected to see a spike in the power required by the rotor system, and that is indeed what we observed. For example, the spike in Flight Two was about 310 watts (W) – well below the maximum capacity of our batteries, which can tolerate spikes as high as 510 W.

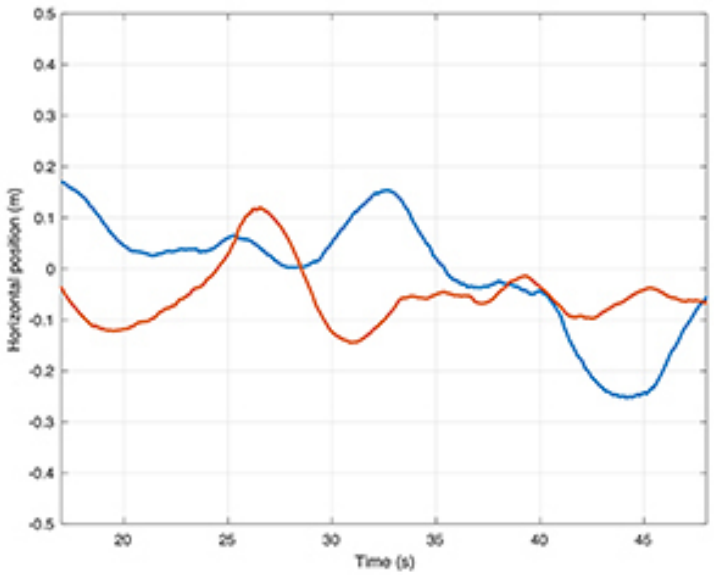
Ingenuity Flight Two:
A picture from the navigation camera aboard Ingenuity captured the helicopter on takeoff during Flight Two, showing little sign of dust.
Credits: NASA/JPL-Caltech



After take-off, Ingenuity took about 2 seconds to reach the 1-meter altitude where it could start using its full suite of sensors. That being said, while we did see some faint dust in the images taken by the Perseverance rover (parked nearby) on take-off, there was no indication flying dust or sand obscured the altimeter or camera, so our design appears to have erred on the cautious side in this regard (which is a good thing).

The moment the helicopter's legs leave the ground, its motion starts to become affected by wind. These winds can cause the vehicle to momentarily roll (side to side) or pitch (forward or backward) on takeoff, until it has time to catch and correct itself. We were prepared for some significant roll/pitch angles on takeoff if winds were high at the ground level, but in Ingenuity's three take-offs so far, they have been limited to a couple of degrees only, making for nice, vertical take-offs.

Hover

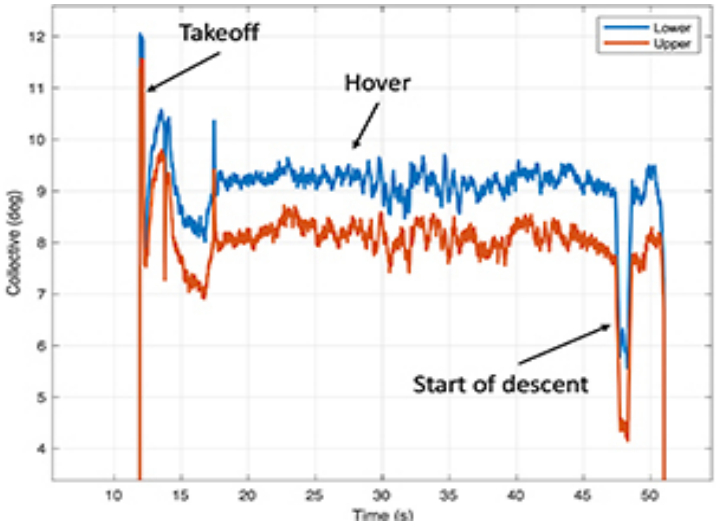


Ingenuity's horizontal position relative to start during Flight One hover. Credits: NASA/JPL-Caltech.

During hover phases of flight, we are attempting to maintain a constant altitude, heading, and position. In evaluating how well we are managing to achieve that, we are forced, for the most part, to rely on Ingenuity's own estimates of what it was doing, as we have limited data establishing "ground truth." Those estimates are subject to errors in navigation that will be covered in a separate post. But the steadiness of these estimates tells us a lot about how tightly the controller is able to hold the desired values.

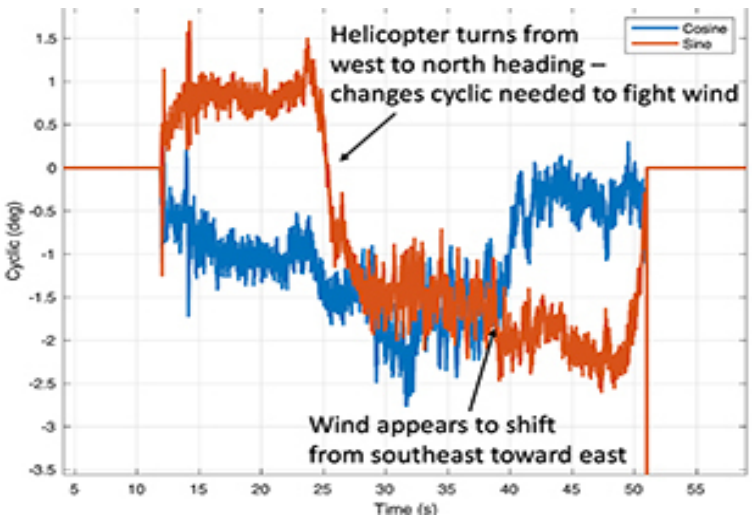
The data shows that we hold our altitude extremely well in hover, to within approximately 1 cm. We also hold the heading (which way we point) to within less than 1.5 degrees. For horizontal position, we've seen variations up to approximately 25 cm. Such variations are expected as the result of wind gusts.

So, what has the wind been like during our flights? Fortunately for us, the Perseverance rover carries the MEDA weather station. For Flight One, we have measurements from MEDA indicating winds of 4-6 meters per second from the east and southeast during most of the flight, gusting to 8 meters per second. Keep in mind that those measurements are made 1.5 meters above ground level, and the tendency is for winds to increase as you go from ground level up. We also have atmospheric density measurements at the time of Flight One, showing 0.0165 kilograms per cubic meter, or about 1.3% of Earth's density at sea level. Using this information, we can assess the system's performance in another important respect – namely, the control effort required to fly.



After takeoff, Ingenuity took about 2 seconds to reach the 1-meter altitude where it could start using its full suite of sensors. That being said, while we did see some faint dust in the 10 Ingenuity's collective control during Flight One. Credits: NASA/JPL-Caltech.

For the collective control (remember, that is the one that changes rotor blade pitch angle uniformly to affect helicopter's thrust), we would like to see hover values roughly consistent with prior expectations. During Flight One, we hovered with around 9.2 degrees collective on the lower rotor and 8.2-degree collective on the upper (that's the angle of the blade's "chord line" – an imaginary line drawn from the leading edge to the trailing edge of the rotor blade – at ¾ of the rotor radius). Those values are 0.7-0.8 degrees lower than the trim values we anticipated (9.0 degree on the upper rotor and 9.9 degree on the lower rotor). But those trim values were tuned based on tests without wind at a somewhat different density/rotor speed combination, so this difference is not unexpected. Another indication that we are within our aerodynamic comfort zone is the electrical rotor power of around 210 W in hover, which is also right in the vicinity of what was expected. Taken together, the results indicate that we have good margin against "aerodynamic stall," which is when the blade airfoil's angle relative to the surrounding airflow is increased beyond the point where it can produce further increases in lift.



Ingenuity's lower cyclic control on Flight One. Similar cyclic controls applied on the upper rotor. Credits: NASA/JPL-Caltech

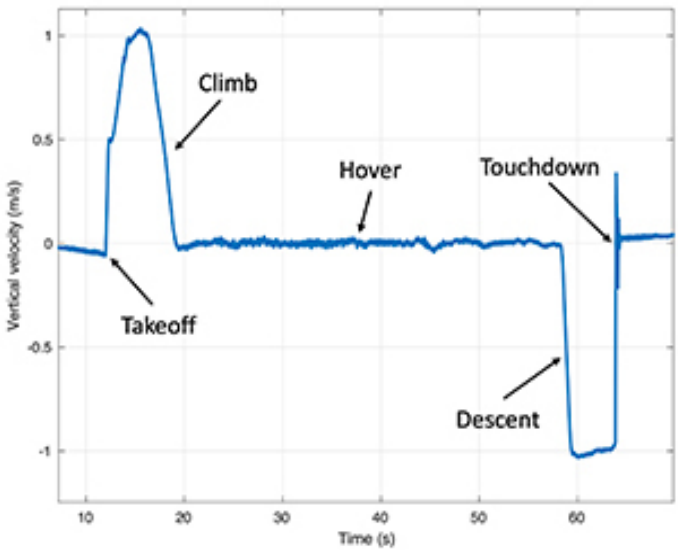
We also evaluate the cyclic control, which is used to create roll and pitch moments on the vehicle. We have seen relatively steady values in hover, generally of magnitude less than 3 degrees, which leaves ample margin against the upper limit of 10 degrees. The cyclic control inputs tell us a fair amount about the wind that the vehicle has to fight against. For example, for Flight One the cyclic control is consistent with winds from the east and southeast, which is in alignment with MEDA observations. The cyclic control effort also increases with altitude, which indicates that winds are getting higher further from the ground.

Landing

Landing is a particularly challenging part of any flight. Ingenuity lands by flying directly toward the ground and detecting when touchdown happens, but a number of events occur in rapid succession leading to touchdown. First, a steady descent rate of 1 meter per second is established. Then, once the vehicle estimates that the legs are within 1 meter of the ground, the algorithms stop using the navigation camera and altimeter for estimation, relying on the IMU in the same way as on takeoff. As with takeoff, this avoids dust obscuration, but it also serves another purpose -- by relying only on the IMU, we expect to have a very smooth and continuous estimate of our vertical velocity, which is important in order to avoid detecting touchdown prematurely.

About half a second after the switch to IMU-only, when the legs are estimated to be within 0.5 meters of the ground, the touchdown detection is armed. Ingenuity will now consider touchdown to have occurred as soon as the descent velocity drops by 25 centimeters per second or more. Once Ingenuity meets the ground, that drop in descent velocity happens rapidly. At that point, the flight control system stops trying to control the motion of the helicopter and commands the collective control to the lowest possible blade pitch in order to produce close to zero thrust. The system then waits 3 seconds to ensure the helicopter has settled on the ground before spinning down the rotors.

People have asked why we contact the ground at the relatively high speed of 1 meter per second. There are multiple reasons for this. First, it reduces the dead-reckoning time that we need to spend without using the camera and altimeter; second, it reduces the time spent in “ground effect,” where the vehicle dynamics are less well-characterized; and third, it makes it easier to detect that we’ve touched down (because the velocity change is clearly sufficient for detection). What makes this strategy possible is the landing gear design which helps prevent the vehicle from bouncing on landing.

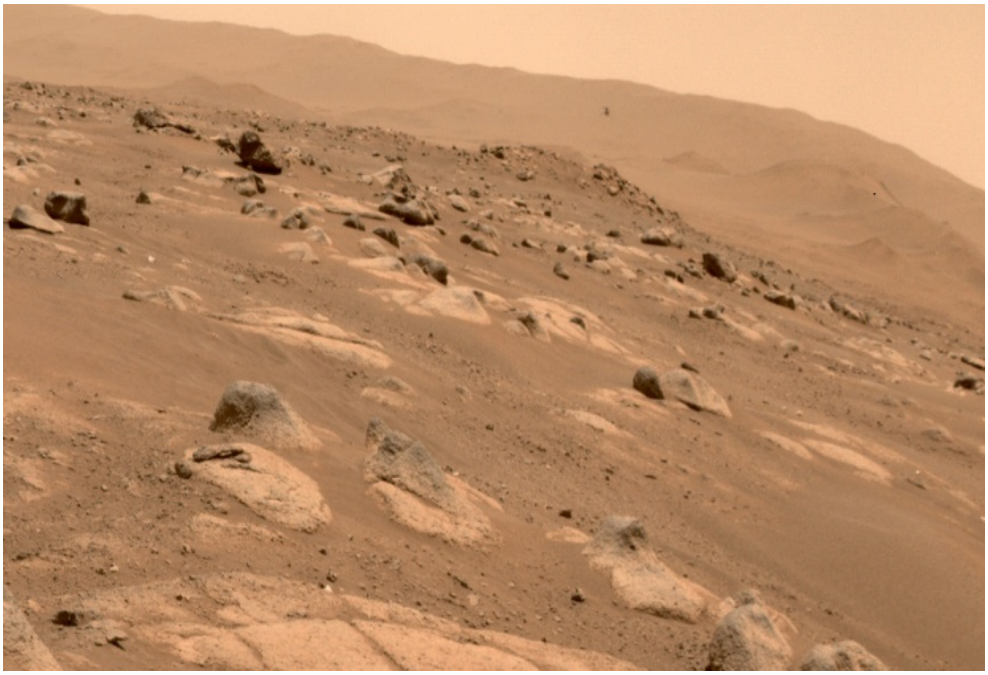


Ingenuity’s estimate of vertical velocity during Flight Two. Credits: NASA/JPL-Caltech.

Any touchdown detection algorithm of this kind has to strike a balance between two potential pitfalls: (1) detecting touchdown too early (thereby dropping to the ground from the air) and (2) not detecting touchdown soon enough (which would cause the helicopter to keep trying to fly after coming in contact with the ground). Data from Ingenuity's flights on Mars show that we were not in danger of either of these scenarios. During descent, Ingenuity has maintained its vertical velocity to within approximately 4 cm per second, and it has detected the necessary 25 cm per second drop within approximately 30 milliseconds of touchdown.
As we continue with our flights on Mars, we will keep digging deeper into the data to understand the various subtleties that may exist and would be useful in the design of future aerial explorers. But what we can already say is: Ingenuity has met or exceeded our flight performance expectations.

April 30, 2021 : Ingenuity Completes Its Fourth Flight

Written by MiMi Aung, Ingenuity Mars Helicopter Project Manager at NASA's Jet Propulsion Laboratory



NASA's Ingenuity Mars Helicopter (above center to the right) is viewed by one of the hazard cameras aboard the Perseverance rover during the helicopter's fourth flight on April 30, 2021. Credit: NASA/JPL-Caltech.

Ingenuity successfully completed its fourth flight today, and we couldn't be happier. The helicopter took off at 10:49 a.m. EDT (7:49 a.m. PDT, or 12:33 local Mars time), climbing to an altitude of 16 feet (5 meters) before flying south approximately 436 feet (133 meters) and then back, for an 872-foot (266-meter) round trip. In total, we were in the air for 117 seconds. That's another set of records for the helicopter, even compared to the spectacular third flight.
We also managed to capture lots of images during the flight with the color camera and with Ingenuity's black-and-white navigation camera, which tracks surface features as it flies. Images from that navigation camera are typically

used by Ingenuity's flight controller and then thrown away unless we specifically tell the helicopter to store them for later use. During this flight, we saved even more images than we did on our previous flights: about 60 total during the last 164 feet (50 meters) before the helicopter returned to its landing site.

NASA's Mars Perseverance rover acquired this image of the Ingenuity Mars Helicopter (upper right) using its left Mastcam-Z camera. Mastcam-Z is a pair of cameras located high on the rovers mast. This is one still frame from a sequence captured by the camera while taking video. This image was acquired on Apr. 30, 2021 (Sol 69) at the Local Mean Solar Time of 12:33:27. Credits: NASA/JPL-Caltech/ASU/MSSS

Capturing images like that provides a technical challenge – another way to test Ingenuity – and provides an aerial perspective of Mars that humanity has never seen before. We'll use these images to study the surface features of the terrain. Some of our black-and-white images were taken as stereo pairs, allowing us to test our ability to make 3D imagery of the surface and study the elevation of different sites below us. Adding this dimension to future missions could offer a broad range of scouting possibilities across regions that rovers can't roam, close-ups that orbiters can't provide, or ways to extend the reach of future human explorers.

But in the immediate future, we have lots of data to analyze. Ingenuity's performance on Mars has been letter-perfect. This is an amazing time for our entire team!

APRIL 30, 2021 : NASA's Ingenuity Helicopter to Begin New Demonstration Phase

The Red Planet rotorcraft will shift focus from proving flight is possible on Mars to demonstrating flight operations that future aerial craft could utilize.

NASA's Ingenuity Mars Helicopter has a new mission. Having proven that powered, controlled flight is possible on the Red Planet, the Ingenuity experiment will soon embark on a new operations demonstration phase, exploring how aerial scouting and other functions could benefit future exploration of Mars and other worlds.

This new phase will begin after the helicopter completes its next two flights. The decision to add an operations demonstration is a result of the Perseverance rover being ahead of schedule with the thorough checkout of all vehicle

rover being ahead of schedule with the thorough checkout of all vehicle systems since its Feb 18 landing, and its science team choosing a nearby patch of crater bed for its first detailed explorations. With the Mars Helicopter's energy, telecommunications, and in-flight navigation systems performing beyond expectation, an opportunity arose to allow the helicopter to continue exploring its capabilities with an operations demonstration, without significantly impacting rover scheduling.
"The Ingenuity technology demonstration has been a resounding success," said Thomas Zurbuchen, associate administrator for NASA's Science Mission Directorate. "Since Ingenuity remains in excellent health, we plan to use it to benefit future aerial platforms while prioritizing and moving forward with the Perseverance rover team's near-term science goals."

The operations demonstration will begin in about two weeks with the helicopter's sixth flight. Until then, Ingenuity will be in a transitional phase that includes its fourth and fifth forays into Mars' crimson skies. Flight four will send the rotorcraft about 436 feet (133 meters) south to collect aerial imagery of a potential new landing zone before returning to land at Wright Brothers Field, the name for the Martian airfield on which Ingenuity's first flight took place. This 873-foot (266-meter) roundtrip effort would surpass the range, speed, and duration marks achieved on the third flight. Ingenuity was programmed to execute a fourth flight Friday, with a takeoff to take place at 10:46 a.m. EDT (7:46 a.m. PDT, 12:30 p.m. local Mars time) and first data to be returned at 1:39 p.m. EDT (10:39 a.m. PDT). The fifth flight would send Ingenuity on a one-way mission, landing at the new site. If Ingenuity remains healthy after those flights, the next phase can begin.

Change of Course
Ingenuity's transition from conducting a technology demonstration to an operations demonstration brings with it a new flight envelope. Along with those one-way flights, there will be more precision maneuvering, greater use of its aerial-observation capabilities, and more risk overall.
The change also means Ingenuity will require less support from the Perseverance rover team, which is looking ahead for targets to take rock and sediment samples in search of ancient microscopic life. On April 26 – the mission's 66th sol, or Martian day – Perseverance drove 33 feet (10 meters) with the goal to identify targets.

"With the short drive, we have already begun our move south toward a location the science team believes is worthy of investigation and our first sampling," said Ken Farley, project scientist for the Perseverance rover from Caltech in Pasadena, California. "We'll spend the next couple of hundred sols executing our first science campaign looking for interesting rock outcrop along this 2-kilometer (1.24-mile) patch of crater floor before likely heading north and then west toward Jezero Crater's fossil river delta."

With short drives expected for Perseverance in the near term, Ingenuity may execute flights that land near the rover's current location or its next anticipated parking spot. The helicopter can use these opportunities to perform aerial observations of rover science targets, potential rover routes, and inaccessible features while also capturing stereo images for digital elevation maps. The lessons learned from these efforts will provide significant benefit to future mission planners. These scouting flights are a bonus and not a requirement for Perseverance to complete its science mission.

The cadence of flights during Ingenuity's operations demonstration phase will slow from once every few days to about once every two or three weeks, and the forays will be scheduled to avoid interfering with Perseverance's science operations. The team will assess flight operations after 30 sols and will complete flight operations no later than the end of August. That timing will allow the rover team time to wrap up its planned science activities and prepare for solar conjunction – the period in mid-October when Mars and Earth are on opposite sides of the Sun, blocking communications.

"We have so appreciated the support provided by the Perseverance rover team during our technology demonstration phase," said MiMi Aung, project manager of Ingenuity at NASA's Jet Propulsion Laboratory (JPL) in Southern California. "Now we have a chance to pay it forward, demonstrating for future robotic and even crewed missions the benefits of having a partner nearby that can provide a different perspective – one from the sky. We are going to take this opportunity and run with it – and fly with it."

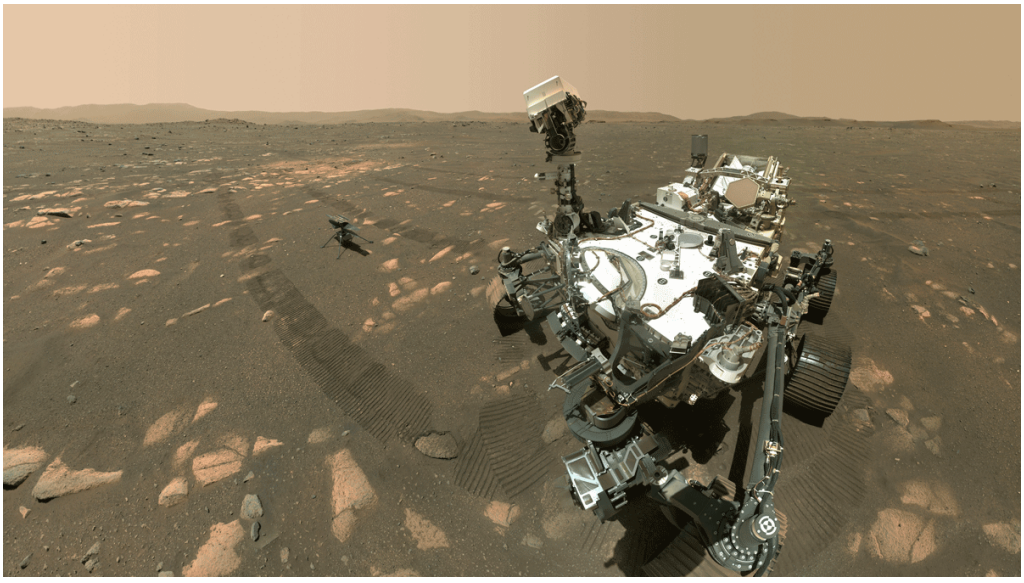
More About Ingenuity

The Ingenuity Mars Helicopter was built by JPL, which also manages this technology demonstration project for NASA Headquarters. It is supported by NASA's Science, Aeronautics, and Space Technology mission directorates. NASA's Ames Research Center in California's Silicon Valley and NASA's Langley Research Center in Hampton, Virginia, provided significant flight performance analysis and technical assistance during Ingenuity's development. AeroVironment Inc., Qualcomm, and SolAero also provided design assistance and major vehicle components. Lockheed Space in designed and manufactured the Mars Helicopter Delivery System.

At NASA Headquarters, Dave Lavery is the program executive for the Ingenuity Mars Helicopter. At JPL, MiMi Aung is the project manager and J. "Bob" Balaram is chief engineer.

For more information about Ingenuity:

https://mars.nasa.gov/technology/helicopter



Perseverance's Selfie with Ingenuity: *NASA's Perseverance Mars rover took a selfie with the Ingenuity helicopter, seen here about 13 feet (3.9 meters) from the rover. This image was taken by the WASTON camera on the rover's robotic arm on April 6, 2021, the 46th Martian day, or sol, of the mission. Credit: Credit: NASA/JPL-Caltech/MSSS*

FOR SALE

Radial Rocket

Engine: Vedeneyev M14 PF 400Hp Radial
Test Run: Producing 430Hp
American Barrett Pistons
American Barrett Electronic Ignition
Pressure Carb, automatic mixture control
Air Start System
Automotive plug conversion
Hrs: 0 Since Factory Strip and Reassembly, 5 Hrs SMO
Propeller New MT 3 Blade Constant Speed with Oversize Spinner

Additional
Cockpit controlled cowl flaps for additional engine cooling control, Side air scoops for ram induction air, and oil cooling, Cowling extended 105mm for oversize spinner

Cockpit
Custom panelled interior with custom designed leather seats, Dual Controls

Avionics
Duel G3X Garmin Displays Front Seat
Single G3X Rear Seat, Garmin Autopilot with separate control face, Dual Garmin Radios
Garmin Audio Panel and intercom

Analog Instruments:
Airspeed Indicator, VSI, Altimeter, Manifold Pressure, RPM, Voltmeter, Oil Temp, Oil Pressure, Fuel Pressure

Digital Instruments:
MGL Engine Monitor, G Meter, Turn & Slip
Three axis trim, and flaps, controlled from fighter aircraft styled joy sticks
Custom built Shakespeare Throttle quadrants
Custom built stowable access ladder + numerous other mods & tweeks
R350 000.00 USD Neg.

Contact Derek Frasca 082 338 3837

FOR SALE

Garmin SL4O Radio with tray

Contact Ant Harris 072 380 6496

WANTED

Cigarette lighter charging cable for a Garmin 296

Contact Mike Brown 082 553 7792

FOR SALE

Bendix magneto and harness. Lycoming starter ring gear/flange. Lycoming generator. Any offers? Looking for glass fiber prop spinner, about 10 inches.

Peter How 083 265 0581

FOR SALE OR RENT

T-Hangar at Kittyhawk Airfield FAKT

Contact Nigel Musgrave 083 675 2211

FOR SALE

New Flight Com Headset – offers?

Contact Geoff Sprenger 079 396 5304

FOR SALE

Large Barrett Leather jacket with a style called "Spitfire".
Perfect condition. Worn only twice and not cleaned.
I have two leather jackets so this one is looking for a new owner. R4 000.00

Contact Nico Brandt 065 127-9015